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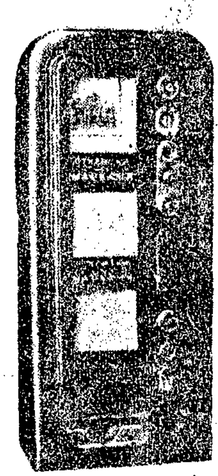
[Following is the complete translation of Vestnik Svyazi (Herald of Communications), issue No. 3 (216), March 1958. Both covers and the Table of Contents of this Russian-language publication were included in the translation.]

INNOVATIONS IN COMMUNICATIONS TECHNOLOGY

TYPE PPO-2 SEMIAUTOMATIC MACHINE FOR THE SALE OF POSTCARDS



The central designing bureau of the Ministry of Communications USSR has developed a special semiautomatic machine for the sale of three types of artistic postcards. The designation "PPO-2" has been adopted for the new semiautomat.

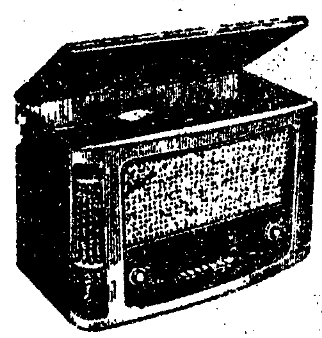
The semiautomat is fed from a 220V alternating current circuit.

To obtain the postcard selected, it is necessary to drop two or three 20-kopeck coins into the coin slot of the semiautomat (depending on the number of coins of this denomination for which the semiautomat is regulated) and to press one of the three buttons found on front of it.

The semiautomat contains three bins, each of which holds 200 postcards with dimensions 106 mm x 149 mm.

The dimensions of the semiautomat are height 893 mm, width 415 mm, depth 267 mm.

THE "VOLGA" RADIO-PHONOGRAPH



The "Volga" radio-phonograph consists of a seven-tube radio receiver and a universal electric record player. The receiver is designed for reception of radio broadcasting stations operating within the ranges of long, medium, short, and ultrashort waves.

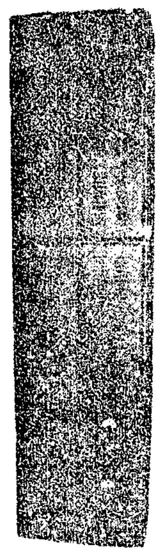
The sensitivity in ranges of long, medium, and short waves is no lower than 200 mkv/m, while in the ultrashort wave range it is no less than 20 mkv/m. An internal ferrite antenna and an ultrashort-wave dipole are installed in the receiver. The acoustic system of the radio-phonograph creates the effect of volume sound.

The frequency bands reproduced are: for reception in the ultra-short-wave range, 80-10,00 cps; in the other broadcasting ranges, 80-4,000 cps; and in the reproduction of phonograph records,

80-7000 cps.

55 watts power is required for reception of radio stations from the network, while for record-playing 70 watts are required. The weight of the radio-phonograph is 21 kg.

THE "VESNA" RADIO RELAY APPARATUS



In the NII of the Ministry of Communications USSR a radio relay apparatus, the "Vesna," designed for the organization of main radio relay communications lines with length up to 5000 km, has been created. The apparatus will be distributed in two versions. Its first version permits organization of up to three operating trunks and one duplex trunk of communications service, where along each operating trunk it is possible to transmit up to 240 telephone conversations and two

broadcasting programs, or a television program (with sound accompaniment).

The second version of the apparatus permits organization of five working trunks, one reserve operating trunk, and one communications service trunk. Along each operating trunk can be transmitted up to 600 telephone conversations and two broadcasting programs, or a television program.

In both versions several receivers or transmitters of the working trunks and service trunk can operate on the general antenna-feeder channel. A television program can be separated at any intermediate station.

The "Vesna" apparatus is designed for work in a frequency range of about 4,000 mc. The intermediate stations are unattended.

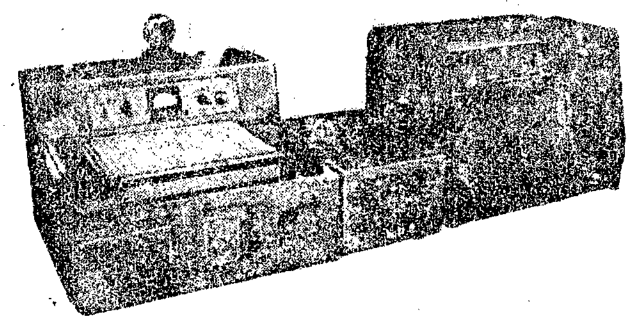
An external view of the receiver-transmitter bay of the "Vesna" apparatus is shown in the photograph.

PHOTOTELEGRAPHIC APPARATUS FTAP

The phototelegraphic apparatus FTAP is designed for the organization of city and intraoblast phototelegraphic communications.

The recording of images by this apparatus is carried out on roll electrochemical paper. The width of the image is equal to 220 mm.

The speed of transmission is 120 lines per minute. The dura-



tion of transmission of an image with dimensions 220 mm x 300 mm is equal to 12.5 minutes.

The FTAP apparatus is fed from a 127 or 220V alternating current circuit.

The power required by the apparatus does not exceed 370 watts.

HERALD OF COMMUNICATIONS

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March 1958

CONTENTS

FOR HIGH QUALITY OF SERVICE TO THE POPULATION

In our country everything possible is being undertaken so that the steadily increasing material and cultural requirements of the workers will be satisfied most fully. Communications media play a great and honorable role in the service of the population.

Clearly, cultural work is the most conscientious way to fulfill one's obligations to the people -- the basic task of Soviet communications workers.

The Soviet government sets aside large appropriations for the development of communications media, radio broadcasting, and television in our country. Many communications undertakings are rigged with the newest apparatus. The composition of communications workers in the last few years has been considerably filled out with diploma engineers and technicians, and the classification of the workers of the mass professions has been raised. The formation of ministries of communications in all the united republics has brought guidance close to the rural enterprises. All this indicates that communications enterprises of the country have the necessary conditions for performing on a high level the tasks of serving the population, the organs of government regulation, and the national economy with all the communications media.

Many facts are known about the selfless labor of communications workers. Not a day goes by that the newspapers of the Soviet Union do

not mention the good work of communications workers, for example, postal workers, who think only of delivering newspapers and correspondence under any meteorological conditions, of delivering a letter with a "mysterious address." Thus, the paper "Taganrog Truth" tells of postal worker I. P. Matyash, who for many years has rendered splendid service to the public in his section: "whether there be rain or snow -- all the same the postman delivers the mail to the addressee and nothing holds it back." "The Leninabad Truth" writes of the leading postman Z. Kozhayeva (second city communications division). The paper "The Evening Moscow" reports on worker of the Moscow postoffice I. F. Peshko. He is a remarkable "pathfinder," who for five decades has been finishing the addresses on letters of forgetful correspondents who have not indicated the house or zone number, or have confused the names of persons or the titles of institutions and organizations. Numerous expressions of gratitude can be read in books for the opinions and speculations of almost any communications enterprise.

However, there are great possibilities for fine and distinguished work by many enterprises, which are not fully utilized. Very often waste is permitted, and the legitimate interests of people who turn to the services of communications organs are violated. The number of complaints emerging from the public -- the objective indicator of the quality of the work -- although decreasing every year, still is extremely large, especially in postal communications.

For what basic reasons do these complaints arise? The chief

of them -- gross violations of operating rules -- primarily by workers of the postal services, telegraph offices, and union printers. The directors of communications enterprises do not use the rights at their disposal for the establishment of daily, careful control directly over the workers of the places, the instruction of communications workers which is carried out is entirely inadequate, and very often novices who have not yet had sufficient experience are in need of instruction. There are also managers who believe that mistakes, waste, and complaints are unavoidable phenomena in daily work. It is clear that such sorry excuses for directors treat bad workers conciliatorily and do not create the proper social opinion around each case of negligence in work.

But the slipshod work of certain communications enterprises sometimes causes such distress to individual people! Recently citizen T. I. Bogdanova turned to the Ministry of Communications USSR with a complaint in which she stated that at the end of last year, learning of the illness of her son, she sent him a telegram from Moscow to Ust'-Kamenogorsk. Four days later she was informed by the Ust'-Kamenogorsk telegraph office that the addressee was unknown at the indicated address. It is plain to see that such news disturbed the mother. Immediately after receiving this news Bogdanova sent the manager of the organization where her son worked an urgent telegram with notification of delivery, but no answer followed. Later events transpired thus: The son of Bogdanova flew in an airplane from

Ust'-Kamenogorsk to Moscow. On account of bad flying weather the airplane was detained en route, and Bogdanov left Chelyabinsk for Moscow by train. He sent his mother telegrams about this from Chelyabinsk and from Kuybyshev. The telegram from Kuybyshev was delivered to her three days after the arrival of her son, while the telegram from Chelyabinsk was not delivered at all, and Bogdanova received the notification of delivery of the urgent telegram a month after she had sent this telegram. The Ministry of Communications USSR conducted a thorough investigation of this sad story. Concrete evidences of poor work were revealed in Ust'-Kamenogorsk and at the central telegraph office of the USSR, and those at fault were punished. Fortunately such cases occur rarely, but we cannot help but agree with T. I. Bogdanova, who characterized all that had passed as callous mockery on the part of the workers of the telegraph office.

Let us cite another example of an extremely negligent attitude toward one's service obligations, -- just now disclosed by postal communications workers. Citizen I. I. Nikitin turned to the Ministry of Communications USSR with a complaint of lack of receipt by the addressee of certain parcels with fruit mailed from Zaporozh'. to Kuybyshev. What did the check show? It turned out that after arrival at Kuybyshev the truck with the parcels was unloaded in two days, but a worker at the Kuybyshev post office, Comrade Sergeyev, instead of ensuring rapid delivery of the parcels of fruit to the addressee, returned them to the postal transport division for official registra-

tion. In the Kuybyshev division of the OPP (postal transport division), as a result of the negligence permitted by the director of the division of parcel post processing and exchange Comrade Nekipelov, the parcels remained there for five days and, finally, the fruits sent in them spoiled. Commentary, so to speak, is superfluous.

At the end of last year Citizen A. T. Pravil'yeva was sent by postal money order alimony in the sum of 532 rubles for the support of two young children. The money order disappeared somewhere, the money was not paid, and it is natural that Pravil'yeva directed a complaint to the Ministry of Communications USSR. An investigation established that the sender of the money order had written the house number incorrectly: he had placed number 77 instead of number 177; however, neither the workers of the 14th communications division of Khar'kov who conducted the payment of money orders, nor the director of this division, found time to do a very simple thing -- to direct a correction in the address to the bureau (for example, the "postal regulations" require that addresses be corrected in similar cases). This is what they did instead: they kept the money order for a month and then returned it to the sender. The fact that Pravil'yeva experienced great difficulties did not trouble them.

Another cause of many vital shortcomings in the work of communications establishments, producing justifiable censure on the part of those inconvenienced, is the low cultural level and lack of industrial knowledge of a portion of the workers. Instead, political-

educative work among communications workers in many collectives is carried on very weakly. Hence formalism and rudeness with regard to the clients still occur in certain communications enterprises.

It is vital that the directors of the communications establishments, together with social organizations, educate the communications workers daily in the spirit of implacability toward shortcomings and aid them to increase their industrial knowledge and raise their cultural level.

A decisive improvement in the quality of the work of communications establishments depends largely first of all on education among the communications workers to a feeling of responsibility for flawless performance of the tasks entrusted to them. But to remove the causes which elicit complaints, as a rule, no capital investments or reconstruction of the establishments are necessary. What is required is that there be a direct responsibility of every Soviet worker -- an attentive, thoughtful attitude toward business and a sensitivity toward the Soviet people.

To attain a decisive change in the service to the population by communications media, an accurate, profound analysis of the disorders existing in the work, the complaints rendered, and the concrete measures taken for the removal of defects is important. It must be confessed that frequently the consideration of complaints directed to the ministries of communications, and to the oblast, kray, and republic (in the autonomous republics) communications man-

agements is formal; the complaints are classified, and then orders are issued calling for good work and everything remains as before. What is needed is active, really organized work on the spot in forestalling the causes which produce complaints. The head communications workers who come out of the republic and oblast centers to the establishments and to the rayon offices, as well as the interrayon controllers, should be of great assistance to them in the removal of vital defects. But the chief thing is unwavering control over the workers on the part of the guiding staff of the communications establishments, reaction against any case of negligence, and intensification of the political-educative work among the communications workers.

Recently, new postal regulations have been issued by the Ministry of Communications USSR. It is essential that a mastery of them be marked by a sharp improvement in the quality of work of the postal communications, to whose services millions of people turn. New rules for the operation of interurban telephone stations and rules for the distribution of print have also been issued. There are enough manuals; all that is needed is that they be strictly fulfilled. In this lies success.

Speaking of an increase in culture as a service to the public by the communications media, we cannot help but touch on the problem of the relationship to the letters of the workers. It is well known that a great many types of letters and declarations by

the workers are received by the government and by the republican ministries and communications establishments. In the letters concrete defects in the work of individual communications establishments are revealed. This is an important source of information to the chiefs of the communications organs on the work of the communications offices and divisions under their control. Hence all managers should be personally acquainted with the letters of the workers, with complaints and declarations, and should receive visitors, which permits them to know better the situation on the spot and to take measures rapidly for the removal of causes generating defects indicated by the workers. Furthermore, not all letters are complaints. Many of them are of the nature of inquiries. It is obvious that inquiries as well as complaints must be answered quickly, to the point, with knowledge of the matter.

A cultured, attentive, thoughtful attitude toward the workers of this city and country should become the style of work of all communications workers. To strive for this in every way is the duty of great and small communications managers.

FOREMOST PEOPLE IN SOCIALIST COMPETITION

The socialist competition of communications workers has been widely expanded in the past year to meet properly the fortieth anniversary of the Great October Socialist Revolution and has promoted to a considerable degree the successful fulfillment of the basic work quotas and the improvement of qualitative indicators of the work of the communications organs.

The Ministry of Communications USSR fulfilled the state production plan in 1957 by 102.4 percent, while the plan of the fourth quarter was fulfilled by 102.6 percent. Without exception, all the communications ministries of the united republics surpassed their production goals, both for the entire year and for the fourth quarter.

The college of the Ministry of Communications USSR and the praesidium of the TsK trade union of communications workers and of automobile transport and highway workers considered the totals of the All-union socialist competition of communications workers for the fourth quarter of 1957. More than 250 collectives of the establishments -- candidates for first place in the competition -- were presented by the communications ministries of the united republics and by the republic committees of the trade unions. As winners of the competition were recognized:

The collectives of communications workers the Khar'kov post office (chief, Comrade Yamkovoy) and of the Moscow city management

of the radio relay network (manager, Comrade Asoyan), with whom the previously awarded trophies, the red banners of the Soviet of the ministers of the USSR and VTsSPS remain and to whom the first prizes were awarded.

The collectives of communications workers: Tashkentskaya oblast (chief of communications management, Comrade Yuldashev), Tallin city division "union printers" (chief, Comrade Nedeshev), Novosibirsk telegraph service (chief, Comrade Bratukhin), Moscow government interurban cable network (chief, Comrade Vinogradov), Kiev management of radio communications and radio broadcasting (chief, Comrade Golovnin), Akhtyrka factory of the UPP communications ministry USSR (chief, Comrade Gafanovich), construction-installation trust board No. 151 "radio construction" (chief, Comrade Slutsker), construction-installation trust board No. 2 "union telephone construction" (chief, Comrade Pomerantsev). For all these collectives the trophies, the red banners of the Communications Ministry USSR and TsK of the trade union of communications workers and automobile transport and highway workers were reserved and first prizes were awarded.

The collectives of the Marynskaya oblast communications office (chief, Comrade Prenko), the Kaunas joint communications office (chief, Comrade Sudeyka), the central telegraph office of the USSR (chief, Comrade Guzovskiy), the construction-installation trust board No. 5 "interurban communications construction" (chief, Comrade Voronkov), the working portions of the trust "Moscow telephone con-

struction" (trust director, Comrade Korenev), with whom the previously awarded trophies, red banners of the Communications Ministry USSR and TsK of the trade union of communications workers and automobile transport and highway workers with remain and to whom first prizes were awarded.

The second and third prizes were awarded to the collectives of communications workers of the Latvian SSR (communications minister, Comrade Aleksandrov), Kzyl-Ordinskaya oblast (chief of communications management, Comrade Mustafin), Taldy-Kuranskaya oblast (chief of communications management, Comrade Bazhenov), Fergana joint communications office (chief, Comrade Appazov), Moscow post office (chief, Comrade Smirnov), Odessa parcel post division (chief, Comrade Rybakov), transport office of Irkutskaya oblast communications management (chief, Comrade Shvetsov), Tallin interurban telephone station (chief, Comrade Slizhevskaya), Vladivostok urban and interurban telephone station (chief, Comrade Silenko), central interurban telephone station (chief, Comrade Nikul), Khabarovsk line-technical junction (chief, Comrade Romanyuk), Sverdlovskaya oblast radio center (chief, Comrade Sapozhnikov), Bakinsk television center (chief, Comrade Mashbits), Moscow urban telephone network (chief, Comrade Pominov), Leningrad urban management of the radio relay network (chief, Comrade Tarasov), Yakutsk urban rediffusion station (chief, Comrade Kuz'min), construction-installation trust board No. 4 "interurban communications construction" (chief, Comrade Lantsman), construction-installation management of radiofication of Turkmen SSR (chief, Comrade Tsoy).

EQUIPMENT FOR AUTOMATICALLY TRANSMITTING AND RECEIVING TELEGRAMS BY CODED SWITCHING

In the past few years many of the telegraphs in the country have changed from the manual method of sending telegraph correspondence to the system of tearing off and transporting a perforated tape, which increases the ~~labor~~ productivity of the telegraph operators as a result of the automatization of the fundamental production operations in transmitting and receiving telegrams. Even with this system, however, a certain significant amount of manual labor must be performed.

With the aim of a further increase in the productivity of labor, the telegraph enterprises of the TsNIIS /Tsentralnyy Nauchno Issledovatelnyy Institut Svyazi -- Central Scientific Research Institute of Communications/ have completed the development of systems of automatization of telegraph communications with the use of coded switching, by means of which all fundamental productive operations of transmission, reception, sorting, intra-station telegram sending are made automatic.

The equipment complex of a station's automatic telegram re-reception with coded switching ("Liman"), developed

by the TsNIIS jointly with the Factory "VEF", was put into operation at the Central Telegraph of the USSR. The operation of this equipment, begun in April of last year, has shown the substantial advantage of the system of coded switching over the system of tearing off and delivering a perforated tape, both in the field of labor productivity and in the delivery speed of the telegram.

In the coded communications system the route of the telegram through the re-reception center of a telegraph net is made by an index route to the designated center in whose zone the destination of the telegram is located. With this there is initiated an automatic switching to all of the re-reception points except the terminal zonal center where the re-reception from the trunk line to the city section or to the rayon office is made semi-automatically with the aid of a pushbutton switchboard.

An automatic telegraph center consists of a number of operating and technical services. The basic one is the trunk line service and the lower communications service in which occur the re-reception of all telegrams passing through the center.

The operating sketch of a trunk line is shown in Fig. 1. Shown in the left part of the sketch is the receiving equipment, and in the right, the transmitting. Each trunk

receiver channel is furnished with a code register table SKR, a code register KR, and an automatic switchboard AK. The direction selector IN consists of a group assembly designed to service 10 reception channels. Equipment for the transmission channel includes a transmission control table SKP, a load equalizer VN, numbering device NU, and automatic clocks ACh.

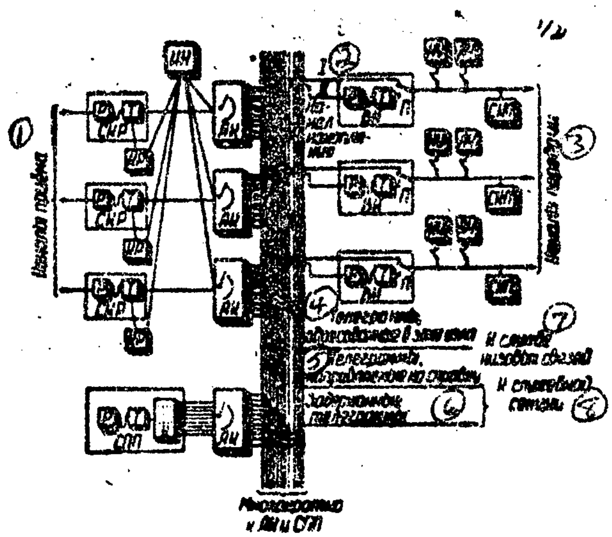


Fig. 1. 1 - Reception channels; 2 - Storage channel; 3 - Transmission channels; 4 - Telegrams addressed to the center's zone; 5 - Telegrams sent for reference; 6 - Delayed telegrams; 7 - To lower communications service; 8 - To the service section; 9 - Multiplex to AK and SPP.

To facilitate operations, the SKR, SKP, and VN of paired channels (reception and transmission) are in close proximity to each other in the equipment room. Fig. 2 depicts a series of double-level SKR and VN tables. The KR, IN, AK, NU, and ACh equipment is mounted on racks installed in a separate room next to the equipment room, as shown in Fig. 3.

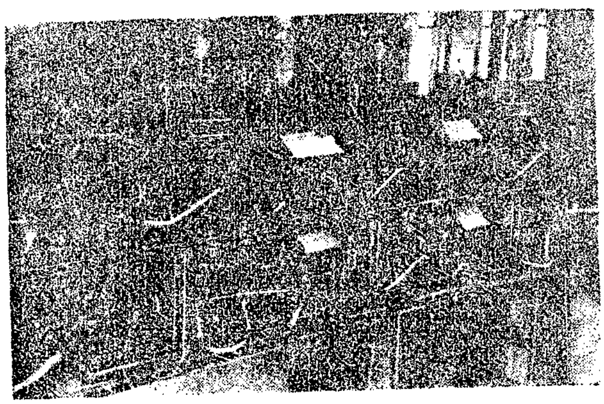


Fig. 2.

Telegrams sent from a neighboring station are received on a perforated tape in the reperforator R of the code register table (Fig. 1). The perforated tape then goes into transmitter T which is situated adjacent to R. The neighboring station, at the beginning of each telegram, transmits a group of service symbols, a so-called pre-heading. If the telegram is received from a terminal point, i.e., from

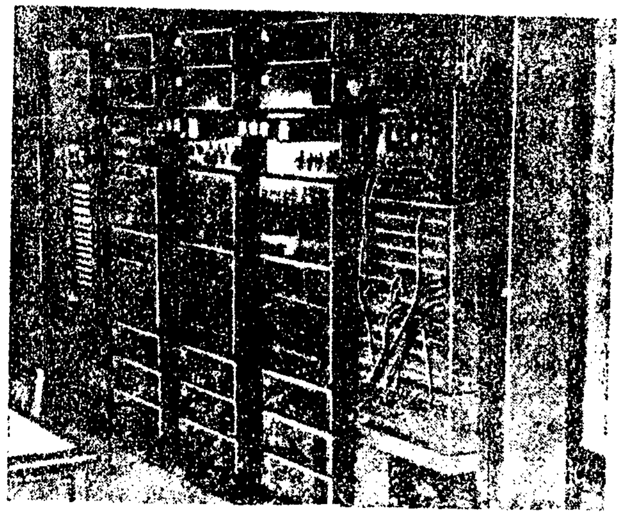


Fig. 3.

a point which does not have coded switching equipment, the pre-heading may have, for example, the following form: 025-P9343. Here, the figure 025 is the three-figure serial number of the telegram; the letter "P" is the index designating the telegram category; and the figure 9343 is the route index. In this case the index "P" indicates that the transmitted telegram is ordinary (telegrams of a higher category receive the indexes "K" and "V"). In front of the index which designates the telegram category, the blank signal is transmitted.

The transmission of the telegram is completed by two

ringing combinations which act on the telegram completion index FKT, which, in the re-reception points, separates one telegram from another.

It is evident that on the tape there may appear between the ringing combinations at the end of the preceding telegram and the serial number of the following telegram various service symbols. These may include combinations of the transfer to an alphabetical register which is used for the purpose of letting the tape out of the reperforator thereby assuming the transmission of the entire received telegram, if another telegram is not immediately following it. The code register transmitter passes all of these service symbols and does not transmit them into the line.

As soon as a serial number of a telegram appears above the transmitter needles, the code register is switched on which then will begin the storage of combinations of all three symbols of the number. The code register has a comparison device which automatically checks the correctness of the stored symbols of the serial number. At the beginning of the work day this device sets on the number 001, and after each transmitted telegram it goes to the following number.

If a telegram number does not follow the preceeding one in

numerical order (in our example, number 025), then the code register will fix the out-of-order number, cease the operation of the transmitter, and switch on the signal to call the operator to the given working place. Automatic verification of the serial numbers has an extremely important meaning, since it completely eliminates the possibility of a telegram loss because of line damage or for other reasons.

After verification of the number, the code register picks up the combination symbols of the route index and the index designating the telegram category and then switches in the direction selector. If the latter is free it is switched into the given code register, deciphers the stored combinations, and acts on the automatic switchboard which readies the circuit for connecting the code register to the channel or with the channel grouping in the required direction. Following this, the direction selector is freed for servicing other code registers in its group. If the output channel (transmission channel) is free, then the final connection of the code register to the channel is effected. As soon as the channel is occupied, the numbering device begins to operate, transmitting into the line the new sequence of numbers. Then the automatic clock sends the correct time, and the code register is then switched in anew.

There is a special data unit in the code register which transmits: 1) the index of the given place of operation, 2) the route index and the index of the telegram category, and 3) the number under which the telegram was received from the receiver channel. When the transmission of the data unit is completed, the transmitter which transmits the telegram is switched on. The activation of the ringing combination on the locater of the end of the telegram, stops its operation and the switchboard automatically frees the outgoing channel.

The telegraph set at the SKP table controls the transmission: it types the pre-heading and text of all telegrams transmitted on the outgoing channel.

For example, if a telegram is received in Moscow from Ryazan and must be forwarded to Murmansk via Leningrad, its pre-heading will be received by the reperforator in Leningrad and simultaneously will be typed by the SKP device in Moscow in the form of the following series of symbols: 238-0634-2RZN P9343 025/. Here the number 238 indicates the new sequence number of the telegram in its transmission from Moscow to Leningrad. The group symbols 2RZN and 025 indicate that the telegram was received in the automatic center at Moscow on the second Ryazan-Moscow channel under the sequence number 025. All of these symbols are necessary for the control over telegrams passing through the automa-

tic center and for conducting various reference checks.

In the re-reception of the telegram in the automatic center at Leningrad, the pre-heading of this telegram transmitted to Murmansk, for example, will have the following form: 191-0637-9MSK P9343 238/025/.

The route index and the index designating the category of the telegram are transmitted by each center without any changes, which facilitates passage of the telegram along automatic telegraph circuit through any number of re-reception points.

In the given example the telegram was transmitted from the code register of the Ryazan-Moscow channel directly into a free output channel of the Moscow-Leningrad channel. If all of the output channels in the required direction are loaded, the telegrams bearing the index "K" and "V" are placed into the sequence, while those with the index "P" are transmitted to the load equalizer, and only when the latter is occupied are they placed into sequence.

The reperforator R of the load equalizer is connected through the intrastation connecting lines (storage channels) into the last contacts of the field selectors AK. Therefore the AK connects first into the output channels, and only if they are occupied does it connect into the load equalizer. From reperforator R of the load equalizer,

the tape goes to the transmitter T which by means of an automatic switching device connects into the output channel in those periods of time when this channel is not loaded with transmissions from the code registers.

In switching those telegrams whose category is determined by the index "K," the automatic switchboard can occupy only the output channel. This facilitates the transmission of the telegram without any delays in the load equalizer tape loop. Furthermore, a "K" index telegram will be transmitted over the first free output channel regardless of whether there are any routine telegrams waiting in line. Telegrams of the "V" index category receive the same privileges ~~in~~ facilitating passage through the centers. The difference is that the index "V" activates a special signaling device. This index is given to those telegrams which because of operating conditions require special control and accounting in passing through a center.

In those instances where there is a large load or the channel is damaged, the telegrams may be delayed for a considerable period of time before being able to get out into the channel. So that they will not be delayed beyond the control period, the period of time for delays is limited. If the delay exceeds the established time, the tele-

grams are switched to the delayed telegram table in the service section from which point they are transmitted by means of the push-button switch device by direct or by-pass circuits.

To prevent the possibility of switching telegrams into improper directions (by errors in the route index), the equipment utilizes a four-symbol digit interference-shielded route code, in which each route index consists of seven operating transmissions. Therefore, whenever extraneous operating transmissions appear or part of a message disappears, route indexes will appear which do not correspond to indexes of the points of designation. In these instances the route selector switches the telegram to the operating reference area of the service section for correction of the indexes and a repeat transmission of the telegram to its recipient.

The control set SKP is used for service messages between neighboring stations. Since the code registers are not pieces of equipment which are serviced, the operator at a neighboring station is called by the signaling device. There is an emergency call key at the SKP, which, when depressed, activates that calling device in the code register of the neighboring station. If there is no need for an emergency call, a service notice without a serial number

is transmitted over the SKP set. It is received in the regular order on the perforated tape at the neighboring station. In this case the operator is called when the signal is activated by the appearance of a non-sequence number, i.e., when the service message comes into the transmitter of the code register.

Work on a telegram accepted at the telegraph office is handled at the initial perforation table SPP by an operator. The operator perforates the outgoing telegram on a tape by means of a typewriter -perforator, and then it is switched to the required channel by depressing the button on the push-button switchboard K.

If the telegram has a route index in the zone of that center, it is transmitted to the lower-communications service (Fig. 4). With this aim, the lower-communications service is connected with the communications trunk of the group of intra-station connecting lines.

The lower-communications service handles telegrams entering, i.e., addressed to, the zone of the given center, as well as those emanating from the zone. Telegrams arriving from trunk communications are received here on a perforated tape printed by the re-perforator R of the switchboards of the lower communications KHC. When a telegram is received, the operator reads the address and dispatches it

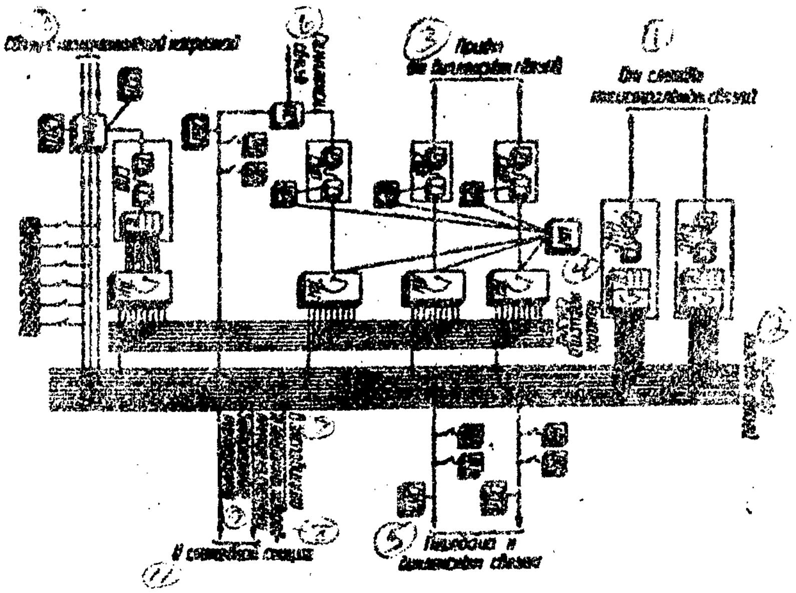


Fig. 4. 1 - From service trunk communications; 2 - Lower communications channels; 3 - Reception from duplex communications; 4 - Trunk channels; 5 - Transmission to duplex communications; 6 - Simplex communications; 7 - To expedition; 8 - Telegrams sent for reference; 9 - Delayed telegrams; 10 - Low-load communications; 11 - To service section.

to the required lower point by depressing the corresponding button on the pushbutton switchboard K. As in re-reception on trunk communications, the transmitter T automatically closes down at the end of the telegram by the activation of the two combination rings by the index at the end of the telegram. Connected to the multiplex field of the KNS are the channels of all automatic lower communications, as well as the connecting lines leading to the service section and to other sections of the center. If the operator determines that the telegram is addressed to the delivery zone of the telegraph, he switches this telegram to the expediter where there is a telegraph set for the reception of telegrams.

Lower communications are divided into three groups: duplex communications, simplex communications, and communications having a light load which work through the concentrator.

Duplex lower communications are equipped in the same manner as trunk communications.

If communications are along the simplex, then the telegraph set of the lower point is connected to the line through the calling device, and the center's equipment is connected through the panel rack of lower communications NS. In principles of operation, panel NS and the signaling

device are similar to the subscriber panel and the ringing device employed with subscriber telegraphing.

When the button on the calling device is activated, the lower-point telegraph set is connected to the reperforator SKR. Upon the completion of the telegram transmission, the worker at the lower point sends the signal "cease" giving the "ring" signal twice. During the reception of a telegram form the center, the tramsmitter of the telegraph set in the lower point is shunted, thus preventing any errors by an accidental depression of the keyboard. However, duplex operation with the SKP of the center is p ds possible after a special button on the calling device is depressed.

In order to increase the use of equipment of an automatic center, lower communications with an insignificant load are connected through the concentrator (conc.). In this case, control over transmissions in several lower points (the number depending on the load) is effected at one telegraph set SKP, while reception is effected at one SKR set or SPP set. In the lower points, as with simplex communications, signaling devices are installed. The table of service messages SSP is used for transmission of service messages on lower communications connected to a concentrator.

Communications work at an automatic center is directed

at the dispatcher point where there are concentrated all signaling means necessary for determining the technical and operational communications conditions -- the extent of the load, the presence of a sequence of telegrams on each of the lines of communications, the over loading of the load equalizer, failures of channels, equipment, etc.

Operating quality of sets and channels is automatically checked by a control-registering device which registers on the telegraph set the appearance of errors exceeding the established norms.

Among the basic elements of equipment at an automatic center are the load equalizer VN, designed to decrease the loss of operating time of the transmitter SKR in switching telegrams. This time loss increases as the load in the output channels is increased.

Theoretical calculations, verified experimentally on an operating center with coded switching, show that in the absence of the VN the operational passage capability of the channels at an automatic center on the average is equal to 50% of their technical passage capability. Any further increase in the load arriving from neighboring stations in the reperforator SKR brings about a progressive growth in the tape loop between the transmitter and the reperforator SKR, which brings about a breakdown in the control periods of a telegram passing through a center.

With the use of a VN, the channel of storage, which is additionally connected to the output channel, aids the unloading of the transmitter SKR during those periods when the output channel is in use. Telegrams which are backed up on the tape loop of the VN are transmitted to the output channel when it is free. If a sequence of telegrams appears, the VN transmitter completes its transmission of the telegram and becomes disconnected from the output channel, thereby permitting the transmission of telegrams from the SKR. After the sequence telegrams have been taken care of, the VN transmitter again fills the interval in the transmission, ledding from the code registers, thus increasing the use of the output channel. At the same time the storage channel connected additionally to the output channel decreases the time lost in waiting for the switching of telegrams from the code registers. As a result of this, the passage capability of the automatic center channels is increased 75-80 percent.

An increase in the speed of operation along the storage channel up to 430 rpm permits a still greater increase in utilization of the trunk channels, since in addition to the decrease in waiting time, the losses in working time of the SKR transmitter are partially compensated as a result of the more rapid movement of the tape.

The "buffer: action of the storage of telegrams in the loop of the VN tape permits the processing of the large streams of telegraphic correspondence on a day of increased holiday load. Moreover, as a result of a centain additional dalay of telegrams of ordinary category

in the load equalizer, the utilization of the channels can reach 100 percent in individual periods.

At the operating center with coded switching, even when transmission along the storage channel was carried out without an increased rate, exchange for individual lines during a day with large load exceeded 3.5 thousand telegrams a day, while the daily exchange for the entire center, possessing nine lines with seven VN, reached 24.4 thousand telegrams. During a normal day the exchange along eight lines was 8-10 thousand telegrams.

The rate of passage of telegrams through the center is considerably higher than for the manual method of processing telegrams and higher than for the system of automation with breaks in the tape. During a day with normal load, 60 percent of the telegrams are transmitted within five minutes (from the moment of reception), 75 percent within 10 minutes, and 85 percent within 15 minutes. Approximately 72 percent of the telegrams of higher categories pass through the center within five minutes.

G. F. Pramnek, candidate in technical sciences;
A. M. Kashcheyev, engineer and scientific co-worker of the TsNIIS

COIN TELEPHONES OF THE TYPE RMT AND THEIR

INCORPORATION IN TELEPHONE STATIONS

Circuits and constructive changes introduced by the manufacturer into coin telephones of the type RMT for their mass production are described. Methods of incorporating coin telephones into telephone stations of various types, ensuring polarity reversal of the wires in answering the called subscriber (redesigning of the circuit of the cord pair or establishment of special terminal sets) are considered.

GENERAL INFORMATION

Since 1954, the home industry has been preparing coin wall telephones of the type RMT, designed for incorporation into manually operated telephone stations.

In comparison with the sample originally developed, described in the journal "Herald of Communications," No. 8, 1952, certain circuits and constructive changes whose expediency was confirmed during experimental operation were introduced in mass production into the coin telephones of the type RMT. Thus, with the aim of more economical construction of the circuit, the spark discharge circuit in these apparatuses is combined with a balancing network. When the special service call button is pushed, the coin-collecting electromagnet works as a ticker (performs the function of a signal relay, sending to the telephone station a signal that the special services call button has been pushed and that therefore the coin telephone

should be joined only with the number of one of the special services). A 1000-ohm resistance, included in series with a selenium rectifier, was introduced into the circuit; in this way a shortcoming of the coin telephone, consisting of an abrupt worsening of the audibility (shunting of the microphone) if the subscriber dropped in a coin by mistake for a special service call, was removed.

The circuit of the coin telephone of the type RMT, into which the changes enumerated above have been introduced, is represented in Fig. 1.

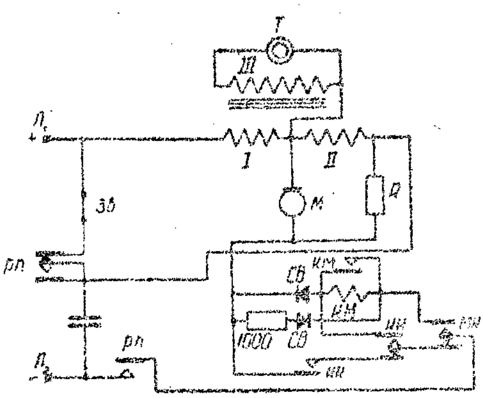


Fig. 1

The following constructive changes have been made in the coin telephone: lengthening of the coin duct, change in the form of the coin box, a strengthened rod angle, lengthening of the crossbar of the cash box lock, change in the form of the loop of the microtelephone holder, sectional selenium bridge replaced by a one-phase selenium rectifier, the group of signaling contact springs transferred from the subpanel to the receiver case, change in the construction of

the contact plates and adapter, screws of the subpanel bracing replaced by pressure springs, abolition of the previously used four-sided receiver case lock, etc.

A requisite condition for normal work of the coin telephone is a change in polarity in the line cables at the moment of the answer of the called subscriber, because the automatic coin collection of the coin telephone is based precisely on the principle of such a polarity reversal. However, of all the types of manually operated telephone stations, only in stations of the type TsBx3 of the factory VEF was the possibility of polarity reversal directly in the circuit of the so-called coin telephone units, mounted in five pieces at each working site of the station, foreseen. In telephones of the stations of the remaining types, such a possibility was not foreseen; hence the necessity arises either of changing the cord pairs in them, separated for service of coin telephones, or of including special coin telephone units. The circuit and description of a coin telephone unit for a telephone station of the type TsBx3 of the factory VEF, as well as the changed system of the cord pair in a switchboard of the type TsBx2, are included in the brochure of N. V. Zakharova and K. A. Bazykin "Coin Telephones" (Communications Publishing House, 1952). Hence only the schemes for coin telephone units for stations of the type TsBx2 and TsBx3x2 are considered below.

CIRCUIT OF A COIN TELEPHONE UNIT FOR A TELEPHONE STATION OF THE TYPE TsBx2

In Fig. 2 is placed the circuit of the coin telephone unit proposed by senior engineer of the Moscow oblast communications management V. V. Denisov, permitting the incorporation of a coin telephone RMT in a telephone station of the type TsBx2 without changing the circuit of the cord pair. As can be seen from this figure, the coin telephone unit consists of five relays -- the call (feed) relay C, the supervisory relays S_1 and S_2, the switching relay S_w, and the busy relay B.

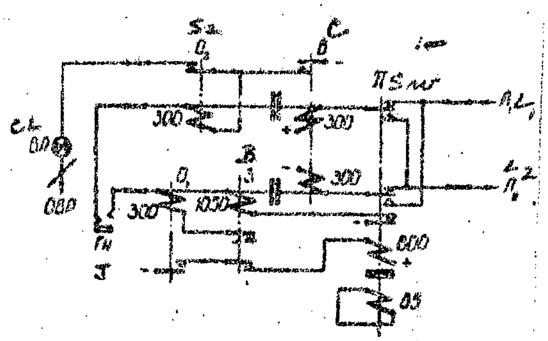


Fig. 2

When a call is made from the coin telephone to the telephone station, relay C, including in its contact the call lamp CL, works in the coin telephone unit. Having seen the call signal, the telephone operator inserts the answering plug into the jack J of the coin telephone line. Thereupon relay S_2 of the coin telephone unit and relay SR_1 of the cord pair work, as a result of which the call lamp CL goes out and the switching lamp SL_1 of the cord pair is not lit.

Answering of the subscriber, test to "busy" and connection with

the called number take place in the usual order. At the moment when the called subscriber answers, the relay SR_2 of the cord pair operates and the switching lamp SL_2 goes out. In the coin telephone unit the relay armature S_1, the circuit of which is closed through the relay winding WR_2 of the cord pair, the line, and the apparatus of the called subscriber, is pulled up. Relay B does not work, since current of insufficient magnitude passes through its winding. With its contact, relay S_1 closes the circuit of relay Sw, which, upon operation, breaks the circuit of relay B and produces a polarity reversal in the wires on the part of the coin telephone. The coin-collecting electromagnet CM is set in motion in the latter, and the coin enters the coin box. The coin telephone is fed through both windings of the relay C of the coin telephone unit.

When at the end of the conversation the ring-off from the coin telephone arrives at the telephone station, the relay armatures C and S_2 of the coin telephone unit and the relay SR_1 of the cord pair are lowered and the switching lamp SL_1 is lit. When the ring-off from the called subscriber arrives, the relay armature SR_2 is lowered in the cord pair and the switching lamp SL_2 is lit.

If the telephone of the called subscriber is busy, then in the coin box unit at the moment of the busy test the relay B, the circuit of which is closed through the receiver case of the jack of the line of the called subscriber, the cap of the call cord, and the cap of the answering cord, operates. This relay breaks the circuit of relay S_1.

The proposal of V. V. Denisov considered above was accepted in 1957 for introduction into the manufacture of switchboards of the type TsBx2. In the type TsBx2 switchboards issued earlier, all the relays of the coin box unit can be deployed at the free places of the relay rack, while the lines of the coin telephone are inserted in the free jacks in the strips with the jacks of the connecting lines.

A cord pair designed for the operation of a coin telephone unit in a type TsBx2 switchboard should have plugs with small heads (in accord with GOST 6865 - 54). If a call plug with a larger head is used, then when it is inserted into the jack of the line of the called subscriber, a brief closing of the springs of the jack can take place, which produces a premature polarity reversal in the wires of the line of the coin telephone and a coin collection.

The given relays of the coin telephone unit proposed by V. V. Denisov are presented in Table 1.

CIRCUIT OF A COIN TELEPHONE UNIT FOR A TELEPHONE STATION OF THE TYPE Tsx3x2

In Fig. 3 the circuit of a coin telephone unit permitting the incorporation of a coin telephone RMT into a telephone station of the type Tsx3x2 is represented. This circuit was proposed by senior technician of the Zhitomir city telephone network A. Kh. Sontse. The coin telephone unit consists of five relays (two line relays LR_1 and LR_2, a separating relay SR, a blocking relay BR, and a polarity rever-

Table 1

(1) Реле	(2) Номер катушки	(3) Число витков	(4) Диаметр провода *мм*	(5) Ток срабатывания *ма*	(6) Примечание
		(7) **Плоские реле**			
В	02061	I 4920 II 4920	0,13	7	(8) У всех плоских реле в качестве корпуса используется корпус катушки № У6830200
О₁	01108	7500	0,16	6,7	
О₂	01108	7500	0,16	7	
П	02164	I 3300 II 4550	0,21	24	
З	02076	14000	0,12	5	
		(9) **Круглые реле**			
В	22436	I 6500 II 6750	0,13 0,17	8	
О₁	11169	10400	0,18	8	
О₂	11169	10400	0,18	8	
П	11057	10900	0,12	25	
З	11026	21000	0,11	12	

Key to Table 1

1. Relay
2. Coil number
3. Number of windings
4. Diameter of wire, mm.
5. Operating current, ma.
6. Note
7. Flat type relays
8. In all the flat-type relays a coil framework number U6830200 is used as the framework
9. Circular relays

sal relay PRR) and two resistances R_1 and R_2. All the relays can be deployed at the free places of a relay rack. In the locality of the station a framework with seven spring jacks for inclusion of coin telephone lines should be established.

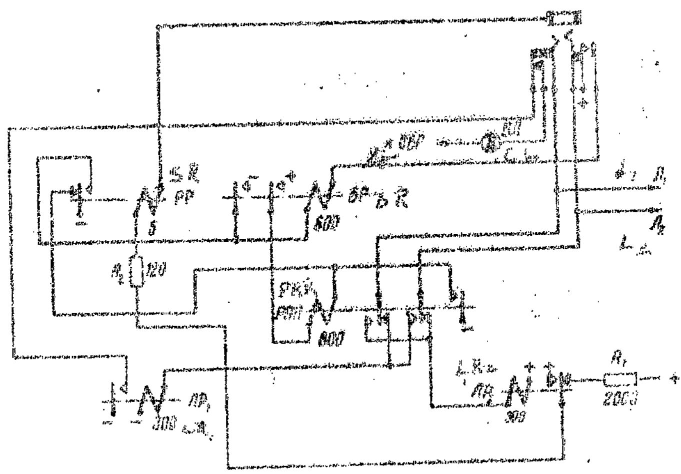


Fig. 3

When the station is called from the coin telephone, the relays LR_1 and LR_2 operate in the coin telephone unit. They include the call lamp CL in their contacts and prepare the circuit for the relay SR.

When the answering plug is inserted into the jack of the line of the coin telephone the lamp CL goes out. In the cord pair of the switchboard relay SR_1 operates, which breaks the circuit of relay SR_2, as a result of which the switching lamp SL_1 is not lit. The separating relay SR of the coin telephone unit thereupon does not lift its armature, since insufficient current passes through it (44.5 ma.).

Answering the subscriber, the busy test, and connection of the coin telephone with the called number take place in the usual way. Upon insertion of the call plug into the jack of the line of the called subscriber, the relay SR_4 of the cord pair operates and the switching lamp SL_2 is lit. In the coin telephone unit the separating relay

SR, the circuit of which is closed through the contact of relay SR_4 and the coil of relay SR_1 of the cord pair, lifts the armature; the current passing along this circuit is equal to 171.4 ma. Relay SR closes the circuit of relay BR, which operates and is blocked by its contact. The circuit of relay PRR is prepared by another contact of the relay BR.

When the called subscriber answers, the relay armature SR_4 of the cord pair is lowered and the switching lamp SL_2 goes out. Thereupon, instead of a minus connected through the contact of relay SR_4 and the 15-ohm relay winding SR_1, a minus will be connected to the relay winding SR through a resistance equal to 400 ohm. Hence the current in the circuit will decrease to 44.5 ma.; relay SR lowers the armature and inserts relay PRR. The latter operates, is blocked by its contact, and produces a polarity reversal in the wires of the coin telephone. In the coin telephone the coin-collecting electromagnet operates and the coin enters the coin box.

The feed of the microphone in the coin telephone is carried out through the winding of relays LR_1 and LR_2. The conversation between the subscribers takes place in the usual way.

When the coin telephone rings off, the relay armatures LR_1 and LR_2 in the coin telephone unit are lowered. By the contact of relay LR_2, the resistance R_1 is inserted in sequence into the circuit of relay SR and SR_1. As a result of this, the current in the circuit decreases to 9.45 ma., and relay SR_1 lowers the armature, closing the

circuit of relay SR_2. The latter, upon operation, turns on the switching lamp SL_1.

When the ring-off signal arrives from the called subscriber, the relay armature SR_4 which cuts in the switching lamp SL_2 is tightened.

The telephone operator makes the disconnection after both switching lamps of the cord pair are lit. At the moment when she removes the answering plug from the jack of the coin telephone line, the relay armatures BR and PRR are lowered, and the circuit passes into a state of rest.

In Table 2 data for the relay of the coin telephone unit proposed by A. Kh. Sontse are presented.

Table 2

	(1) Реле	(2) Номер катушки	(3) Число витков	(4) Диаметр провода *мм*	(5) Ток срабатывания *ма*	(6) Примечание
		(7) **Плоские реле**				(8)
LR$_1$	ЛР$_1$	01108	7500	0,16	9,3	У всех плоских реле в качестве корпуса используется корпус катушки № У6830200
LR$_2$	ЛР$_2$	01108	7500	0,16	8,7	
SR	РР	02171	950	0,50	140,0	
BR	БР	02092	10800	0,14	7,2	
PRR	РПП	02092	10800	0,14	12,0	
		(9) **Круглые реле**				
LR$_1$	ЛР$_1$	11017	8850	0,17	8	
LR$_2$	ЛР$_2$	11017	8850	0,17	6	
SR	РР	22410	1300	0,51	140	
BR	БР	11012	13700	0,16	10	
PRR	РПП	11012	13700	0,16	20	

Key to Table 2

1. Relay
2. Coil number
3. Number of windings
4. Diameter of wire, mm.
5. Operating current, ma.
6. Note
7. Flat-type relays
8. In all the flat-type relays a coil framework number U6830200 is used as the framework
9. Circular relays

N. V. Zakharova and A. S. Savenkova, engineers

TO EXPEDITE THE CREATION AND INTRODUCTION OF MULTI-PROGRAM SYSTEMS OF WIRE BROADCASTING

The article is a short survey of the present situation and future prospects in the field of multi-program wire broadcasting.

One of the most important tasks of Soviet radio broadcasting is to make it possible for listeners to have a choice of programs. Multi-program broadcasting plays a particularly important role in the national republics where the varied population makes it necessary for several programs to be broadcast simultaneously in different languages.

Multi-program broadcasting in our country is achieved by the continuous growth and development of the EFERNY (ether) system of broadcasting. This system consists of long wave and medium-wave-frequency radio broadcasting stations, ultra-short-wave broadcasts and television nets. Currently, in much of the territory of our country it is already possible to receive two programs from the All-Union broadcasting system. However, in the U.S.S.R. the majority of radio listeners utilize a wire broadcast system, and this is still only good for single program transmission.

If we keep in mind that wire broadcasting and wireless broadcasting must both expand in the U.S.S.R. with one supplementing the other, then the real need becomes evident for intensive work to establish and utilize a system of multi-program wire broadcasting.

At the end of the twenties and the beginning of the thirties several buildings in Moscow were equipped by the Moscow Radio Relay Net (MGRS) with a two-or three-program wire system. This system uses individual circuits and amplifiers for each program. The listener has a choice of programs.

In the years 1936-1938 the MGRS specialists worked out a multiprogram system based on the utilization of a special net of multipair cables. This system was not developed, however, due to its high cost.

In approximately the same years A. V. Vinogradov recommended a system for transmission of several programs over the lines of the Municipal telephone networks. This system was not introduced because we lack the basic necessities for it to operate. That is, our municipal telephone nets are not sufficiently developed. In addition, there are several other deficiencies inherent in the system.

Before the war there were experiments with a multi-program broadcasting system based on high-frequency modu-

lated current going through the municipal electric systems.

In 1948 LONIIS worked out a system based on superimposing high-frequency modulated current carrying two additional programs on the already operating three-section nets of the radio relay centers. Using this system they organized an experimental area in Leningrad. However, for a series of reasons this system too was not further developed.

In 1950 experiments were carried on in Ashkhabad, where the local radio people had set up an experimental area. The specialists of the Ashkhabad DRTS are currently continuing their work to perfect their system. In this system they have changed the construction of the receivers by utilizing multi-wire apparatus instead of the individual subscriber receivers which are used for group receiver-amplifiers. In the new system the programs are carried to the subscribers by low frequency through a net which consists of three separate pairs of wire. However, the experimenters have not as yet achieved significant results in developing a multi-program wire broadcasting system.

It should be emphasized that all attempts to create a multi-program wire broadcasting system in the U.S.S.R. have been made under what are primarily urban conditions.

How are things along this line in foreign countries? There, multi-program wire broadcasting is done chiefly by

utilizing their well-developed telephone nets or by using an individual physical means for each program, including amplifiers and lines (mainly cables).

Considering the possibility of borrowing the experience of foreign countries it must be said that we cannot use their telephone system of multi-program wire broadcasting on a wide scale until our telephone nets have grown considerably. The other system, which uses a separate physical channel for each program, because of its high cost can only be used in areas having a high density of subscriber radio sets.

In the last few years the problem of designing a multi-program wire broadcasting system has become particularly pressing. As evidence of this there are the numerous letters which listeners have sent to the Ministry of Communications, the State Committee for Radio and Television Broadcasting, and to other organizations.

In 1955-1956 the Ministry of Communications of the U.S.S.R. again went to work on multi-program wire broadcasting. The NII (Research and Development Institute) of the Ministry of Communications of the U.S.S.R. was given the task of developing a system for transmitting several programs by means of wire.

The prerequisites for a new technical solution to

this problem were development of highly effective, inexpensive, miniature parts and semi-conductor equipment. The use of semi-conductor equipment will permit the construction of amplifiers which are reliable and which have an extremely high efficiency and of other equipment which will be able to operate for long periods without adjustment.

The institute found very effective means and methods for establishing a multi-program wire broadcasting system and decided that the system which had been developed would be introduced in the future.

The system is based on the following fundamental principles: the basic and two supplementary programs are transmitted over the existing nets of the radio relay centers. In doing this the basic program is transmitted by high-level audio-frequency currents and the additional programs (one or two) by amplitude-modulated, high-frequency, low-level currents.

The following carrier frequencies have been chosen: for the second program 46 kilocycles (service band of 40-52 kilocycles), for the third program 78 kilocycles (service band 72-84 kilocycles).

Between the loudspeaker and the rosette the subscriber will have a simple apparatus which will permit him to switch to the desired program.

Keep in mind that the quality of the additional program channels must be as good as that of the basic low-frequency channel.

For agricultural areas this system uses high-frequency currents for the additional programs, and they come out of transmitters through band filters into the transmission lines, thus utilizing a wire-to-wire system.

In order to reduce the loss of high-frequency currents in the subscriber's transformers the currents are shunted through intermediate devices consisting of a high-frequency transformer and filters. If it is necessary to increase the range of operation of the system, then high-frequency line amplifiers on semi-conductor equipment are either built into the intermediate devices or are installed separately.

The system was planned for use with a remote power supply for the subscriber's receivers. However, the designs indicated that due to large power loss it would not be efficient to utilize direct current for power if the lines were long. Therefore, a common group rectifier will be used on each subscriber net. A constant density will be fed out of the rectifier to the receivers over a system of two wires and a ground.

The subscriber's receivers are to be designed on the

direct amplification system. The receiver can have one or two input filters (depending on the number of programs), a rectifier, and a low-frequency amplifier on semi-conductor triodes.

For nets in cities we will use receivers and amplifiers for the additional programs for all the subscribers in each building. Also, the programs will be transmitted to the subscribers by low-frequency currents through a triple pair cable. As a result of this the subscriber will only require a switch for the program and the loud speaker.

In many cases in a city transmission of the additional programs to the subscriber will be done by high-frequency currents and then all he will need will be a very simple receiver.

All the suggested systems for multi-program broadcasting were discussed by the collegium of the Ministry of Communications of the U.S.S.R.

During this current year a test area for experimental purposes is going to be set up in Moscow and in Kiev. It will test triple program broadcasting (including the existing low-frequency program).

The NII (Research and Development Institute) and its experimental factory have been given the job of developing and manufacturing the equipment for the Moscow test area.

Part of this equipment will comprise a transmitter for two programs, a unit of line filters, by-pass and matching equipment and three group, triple-program receivers with low-frequency amplifiers.

In order to equip the radio points in the buildings, subscriber accessories are being manufactured. These consist of splitting and limiting boxes and subscriber boxes with program switches.

In the buildings in the test area they are going to install group receiver-amplifiers. From these the programs will be piped within the building at a low frequency and each over a separate physical channel. In order to accomplish this the NII of the cable industry developed a special triple-pair cable and an experimental batch of it has already been manufactured. The cable has three separate pairs enclosed in a single polychlorvinyl covering.

Much work faces the MGRS in the problem of introducing multi-program broadcasting. It must set up the equipment and install the transmission net. Right now the MGRS is doing preparatory jobs such as choosing the buildings for the experimental area and getting the feeder lines into operating condition.

The MGRS is simultaneously organizing an experimental area for triple-program broadcasting using low-frequency

and the special triple-pair cable for the subscriber lines as well as for the feeder lines.

The introduction of multi-program wire broadcasting is one of the most important problems of radio personnel and it must be solved in the near future.

O. V. EFIMOVA - senior engineer of the Directorate of the television receiver net, radiofication and intra-rayon electro-communications of the Ministry of Communications of the U.S.S.R.

A SINGLE LEVEL INDICATOR FOR RADIO BROADCASTING IS NEEDED

Considerations of the selection of the most expedient time of integration for level indicators used in radio broadcasting are presented.

Radio broadcasting has existed for 35 years, but until now there has been no single international unit for the measurement of the level of a low-frequency broadcast signal. Nor is there any single measuring apparatus for the control of the level of a radio broadcast program. The recommendations of the MKKR determine only the classification of the level indicators depending on their time characteristics, but give no indications of the magnitude of the time of integration, necessary for control of the level of high-quality transmission of speech and music.

In radio broadcasting, sound recording, and the movie industry in the USA, since 1938 and to the present a standard indicator of average values of the type VU with an integration time 300 msec has been used. It is simple, cheap, does not occupy much space, does not require a feed source, and its readings correspond to the volume of the signal. A sound producer which maintains a volume of transmission according to the indications of a VU apparatus frees the radio listener from the necessity of using a volume-regulating device when the nature of the program transmitted changes. But here the maximal peaks of the broadcast signal, capable of producing overmodulation of the system,

i.e., of creating audibly noticeable distortions or leading to operation of the transmitter protection, are noted by the apparatus with an error up to ± 9db depending on the nature of the program transmitted. Thus, if it is necessary to ensure high quality of transmission, the apparatus VU proves to be unsuitable. In addition, the apparatus VU somewhat magnifies nonlinear distortions in the line of transmission, which cannot be permitted in a modern high-quality channel. Other defects of the apparatus VU are the small range of measurement (for a fixed position of the change-over switch, the sensitivity of the range of measurement comprises 23 db in all), the insufficient rate of motion of the pointer, creating a certain lag of the visual impression behind the auditory impression when the volume of the sound increases. Hence in western European stations, where high requirements of sound quality are set forth, use of the apparatus VU has long ago been discontinued.

Here in the USSR, in radio broadcasting apparatuse (RVA) and at radio stations under the supervision of the ministry of communications, sound level meters with a time of integration of 20 msec. are principally used. New radio broadcasting setups, manufactured by the UPP factories of the Ministry of Communications USSR, are supplied with sound level meters of the type I - 53 (developed by the MDRSV), which also have an integration time equal to 20 msec. In studio apparatuse and sound recording setups under the supervision of the State Committee on Radio Broadcasting and Television, level indicators of the type RI - 55

(developed by the VNAIZ) with an integration time of 60 msec. are principally used. On account of the lack of agreement of the readings of various types of level indicators used along the radio broadcasting network, there are frequent cases of incomplete utilization of the technical equipment of our radio broadcasting stations or of work with distortions as a result of overloading of some link of the network.

Both of the level indicators mentioned above -- I-53 and RI-55 -- do not meet the current requirements. The basic shortcoming of the apparatus I-53 is the slow motion of the indicator, which produces poor ballistic characteristics of the galvanometer. Hence I-53 can be used only in RVA and on transmitters, but it is not suitable for the benchboard of the sound producer. The principal shortcoming of the apparatus RI-55 is the large integration time (60 msec.). A vital shortcoming of both indicators is the poor visibility of the pointer. Hence neither of these two indicators can be recommended as a standard indicator.

Here we should dwell in particular on the level indicator RI-55. By means of selection of a certain intermediate magnitude of the integration time (60 msec), an attempt was made to resolve simultaneously the following problems: a) to free it from shortcomings inherent in apparatus of the maximal and average values; b) to "lighten" the work of the sound producer, by making the short peaks of the signal less noticeable for visual observation; c) to spare radio

listeners from the necessity of using volume regulation devices when the nature of the transmitted program changes; d) to raise the average depth of modulation of the transmitters.

In our opinion, such a "compromise" is impossible, since it is impossible to change the physiology of the human ear. The integration time of 200 msec., recommended by the MKKR for indicators of average values, corresponds to a hearing adaptation time, and hence readings of the average-value apparatus correspond to the volume of the signal. Indicators of the maximal values with integration times up to 10 msec. record the maximum peaks of the signal, capable of producing overmodulation and of creating audibly noticeable distortions, with an accuracy sufficient for practical purposes. The level indicator RI-55 with an intermediate magnitude of the integration time, equal to 60 msec., does not give the operator a correct idea either of the volume or of the depth of the modulation, and the selection of such an integration time can in no way be justified.

It has long been established that one must not entrust an automaton with the dynamic range compression of a musical program: the sound will be weak, lacking in contrast, "soulless." For just this reason the idea of replacing sound producers by an automatic device has been discarded. Trying to "lighten" the work of the sound producer by means of increasing the integration time of the level indicator to a certain degree recalls the intention of automating the action of the producer, an idea which is incorrect and even harmful.

Another erroneous idea is that an increase in the integration time alone and of itself leads to an increase in the average depth of the modulation, increases the operating distance of the radio station, and improves the quality of reception under conditions of interference.

Matters are actually just the opposite. If the level indicator lowers the readings on the peaks of the signal, then the operator at the initial link of the network tries to maintain the required depth of modulation, increases the level, which leads to an overloading of the following sections. Of course, when an inertial amplifier-limiter is present in the network, such overloading cannot take place. But in this case distortions of the dynamic picture of transmission occur, permissible in an inartistic program of speech, but absolutely unacceptable in the case of a musical program. Hence only the indicator of maximal values makes a complete utilization of the established power of the radio station without risking distortions, and the greatest means of economization possible. There is no doubt that this economy pays back with interest the high (in comparison with the cost of simple and cheap apparatuses of average-values) cost of indicators of maximal values.

The problem of a single level indicator for radio broadcasting has recently been raised, and it should be resolved as soon as possible. The absence of a single level indicator causes definite harm to the quality of radio broadcasting today and creates difficulties

for the international exchange of television and radio programs planned for the near future.

In the resolution of the problem of the magnitude of the integration time for the standard radio broadcasting level indicator, the results of works performed several years ago in western Germany on a comparison of apparatuses of the type VU (integration time 200 msec.) and of the type U21 (integration time 10 msec.) with a special sound-level meter whose integration time was equal to one msec. should be taken into consideration. A recording instrument with time characteristics analogous to the time characteristics of the corresponding level indicator was inserted in parallel into each of the apparatuses. During these experiments three recording instruments simultaneously recorded the "levelgrams" of various radio programs of a German transmitter and an American transmitter, situated in Germany.

The analysis of the levelgrams performed permitted the conclusion to be drawn that for speech and musical programs of various types the records of the sound-level meters with integration times of 10 msec. and one msec. practically coincide. Only in rare cases were the readings of the apparatus U21 lower than the actual values of the voltage peaks by one to three db. The scattering of the readings of the apparatus VU relative to the peaks measured by the apparatus U21 comprised up to ± (seven to nine) db. It is interesting to note that for speech programs the error of the readings of the apparatus had not only a negative but sometimes a positive sign, and served as

a cause not only of overmodulation, but sometimes of insufficient modulation of the transmitter as well.

"Later analogous investigations were also performed in Poland, as a result of which the specialists of the Polish radio — for technical and economical considerations — also put into use an adaptation of a maximal-values indicator. We should also keep in mind the fact that at present sound-level meters with an integration time equal to 10 msec. are used not only in the FGR and GDR, but also in Austria, Holland, Yugoslavia, Rumania, Poland, Egypt, and in a number of other countries of Europe and Asia. In France sound-level meters of three to six msec. (information for 1949) and in England of four msec. (information for 1953) were being used.

It is evident that for purposes of increasing the quality of the sound of our radio broadcasting stations, as well as for the creation of the possibility of normal control and regulation of the level of transmission for an international exchange of radio and television programs, we should use for the single level indicator a time of integration approximately equal to 10 msec. (for 90 percent accuracy in the readings).

Here it is expedient to have two variations of apparatuses: the first — for operational control — a broad range (for example, of the type of the German U21) with a limit of measurements up to 55 db (taking into consideration thepossibilities and requirements of ultrashort-wave FM broadcasting), set up on the benchboard of the

sound producer (at the initial link of the network); the second -- simpler and cheaper -- for operational control with a range of measurement up to 23 db; it will be used in the RVA and at radio stations where only control over the level of transmission according to the maximum peaks is necessary.

Apparatuses of both types, included along the circuit, will give uniform readings of the peaks of transmission if they do not differ in integration time, overshooting of the pointer, and frequency characteristics. Other properties of these apparatuses -- such as the time of motion of the pointer along the scale during operation, the time of return of the pointer, etc. -- can be varied.

In the table are presented the possible basic technical characteristics of both variants of the level indicators.

The indicator for operating control should have an approximately linear scale, graduated in decibels; the scale of the indicator for operating ("exploitational") control also should have an approximately linear scale, but graduated in percents of modulation.

To minimize fatigue of the eyes of the operator, a black scale with white divisions and a white pointer is preferable. The number of divisions on the scale should not be large -- for a broad-range apparatus approximately 10 to 11, for a narrow range apparatus approximately six to seven. The pointer and divisions should be easily discerned by an operator with normal vision at a distance of 0.7 meters.

It is quite evident that the mere introduction of a single lev-

Техническая характеристика	Индикатор для оперативного контроля уровня	Индикатор для эксплуатационного контроля уровня
Диапазон измерения	55 *дб*	23 *дб*
Неравномерность частотной характеристики в пределах 30-15000 *гц*	± 0,5 *дб*	± 1,0 *дб*
Входное сопротивление	не менее 30 *ком*	не менее 10 *ком*
Входное напряжение для отклонения стрелки до *M* = 100%	0,775 *в* и 5,5 *в*	0,775 *в* и 5,5 *в*
Время интеграции	10 *мсек* при 90%	[illegible]0 *мсек* при 90%
Выброс стрелки	не более 10%	не более 10%
Время движения стрелки при срабатывании от 0 до отметки *M* = 100%	не более 200 *мсек*	не более 300 *мсек*
Время возврата стрелки от *M* = 100% до *M* = 10%	1 или 2 *сек*	3 или 4 *сек*
Количество и тип указательных приборов	один главный с оптической шкалой длиной 150 — 170 *мм* один стрелочный на панели для целей градуировки с длиной шкалы 60 *мм* два таких же стрелочных выносных прибора для установки на пульте	один стрелочный на панели (для градуировки прибора) с длиной шкалы 60 *мм* один такой же стрелочный выносной для установки на пульте

el indicator does not give a substantial improvement in the quality of the sound. It is necessary to take as well certain organizational-technological measures, for example:

1. Background recordings of the magnetic films should be carried out with a maximal dynamic range, proceeding from the possibilities of magnetic films and tapes.

2. Musical and other artistic magnetic films, designed for transmission through radio broadcasting channels, should be recorded

Key to Table

1. Technical characteristics
2. Indicator for operating control of level
3. Indicator for operating ("exploitational") control of level
4. Range of measurement
5. Irregularity of frequency characteristics within the limits of 30 - 15000 cycles per second.
6. Input resistance
7. No less than 30 kohm.
8. No less than 10 kohm.
9. Input voltage for deflection of the pointer up to M = 100 percent
10. 0.775 v and 5.5 v
11. 0.775 v and 5.5 v
12. Time of integration
13. 10 msec. for 90 percent
14. 10 msec. for 90 percent
15. Scattering of pointer
16. No greater than 10 percent
17. No greater than 10 percent
18. Time of motion of the pointer in operation from zero to the point M = 100 percent
19. No greater than 200 msec.
20. No greater than 300 msec.
21. Time of return of the pointer from M = 100 percent to M = 10 percent
22. One or two sec.
23. Three or four sec.
24. Quantity and type of indicated apparatuses
25. One principal with optical scale of length 150 - 170 mm.
    One indicator on the panel for the entire graduation with scale length 60 mm.
    Two such indicators removed from the apparatus for installation on the benchboard
26. One indicator on the panel (for graduations of the apparatus) with scale length 60 mm.
    One such indicator removed for installation on the benchboard

with a compressed dynamic range in the case of manual mixing (using as well inertial automatic mixers). Operation should proceed analogously for studio artistic transmissions and broadcasts from concert halls. The auditory control apparatus should contain an amplifier-limiter (the same as for the transmitter).

3. In connection with the necessity of overlapping interference levels at the site of the reception and improving the intelligibility of speech of magnetic films designed for nonartistic speech programs, they should be recorded with a compressed dynamic range with the aid of inertial automatic compressors and, when necessary, using a frequency correction.

4. The selection of staffs of sound producers should be improved and systematic work should be undertaken for raising their specialized and technical preparation. For the purpose of regulating the work of sound producers, they should be under the control of a technical director -- the chief engineer of the radio station or management.

5. It is essential to resolve the problem of means of removing those departmental barriers which for many years now have been bringing harm to radio broadcasting in connection with the fact that individual links of the radio broadcasting network lie in the hands of two agencies -- The Ministry of Communications and The State Committee on Radio Broadcasting and Television.

B. S. Mints, engineer

FOR 1958

SUBSCRIPTIONS ACCEPTED WITHOUT RESTRICTION

ACCEPTANCE OF SUBSCRIPTIONS TO THE JOURNAL "VESTNIK SVYAZI" (HERALD OF COMMUNICATIONS) IS CONTINUED

by the city divisions of the Union Printing House, in all the communications offices and divisions, and by the public representatives in establishments and institutions.

A FOUR-ELECTRODE PIEZOELECTRIC RESONATOR FOR THE FREQUENCY RANGE 250 - 600 Kc

A scheme of utilization of a four-electrode piezoelectric resonator with oscillations on the second harmonic in filters is considered. The use of such a scheme makes it possible to double the number of resonators in quartz filters which serve for the separation of group carrier frequencies in a high-frequency apparatus of the type B - 12.

In piezoelectric filters for the frequency range 250 - 600 kc, assembled according to a balanced scheme, two-electrode resonators with longitudinal oscillations on the third harmonic are used. In each link of such a filter there are four resonators (Fig. 1). If instead of two-electrode resonators, four-electrode resonators are used, then the number of resonators in each filter is cut in half.

Four-electrode resonators with oscillations on the basic frequency, applicable in piezoelectric filters for frequency ranges of 60 - 150 kc, are obtained by dividing a layer of metalizing of a longitudinal band into two equal parts. However, in this case the method indicated is not suitable, since the plates obtained for a frequency range of 250 - 600 kc are very narrow; this makes the soldering of wires (tape) to each half of the plate very difficult.

As the four-electrode resonators for the frequency range 250 - 600 kc, resonators with oscillations on the second or any other even harmonic can be used. Moreover, for a resonator with oscillations on the second harmonic, the layer of metalizing of each of the two basic

faces of the plate divides the transverse line into two equal sections.

The frequency f_p and the inductance L_q of the resonator with longitudinal oscillations on the harmonic are related to the dimensions of the quartz plate by the following formulas:

$$f_p = \frac{nK_f}{l}, \quad L_q = K_L \frac{S}{n^2 t},$$

where n is the number of the harmonic, l is the length of the plate in centimeters, t is the thickness of the plate in centimeters, S is the area of the electrodes in square centimeters, K_f and K_L are constant coefficients depending on the angle of the cut of the plate with regard to the axis of the crystal. For a quartz plate with an angle of cut equal to -18.5 degrees, $K_f = 255 \cdot 10^3$ cps.cm and $K_L = 139$; for narrow plates with an angle of cut comprising $+5^\circ$, $K_f = 280.5 \cdot 10^3$ cps.cm and $K_L = 100$. In Fig. 2 two schemes of the inclusion of four-electrode resonators with oscillations on the second harmonic in filters symmetrical with respect to the longitudinal axis and schemes equivalent to them are presented, while in Fig. 3 the X-scheme, comprising two quartz four-electrode resonators, included in accord with the schemes in Fig. 2, is represented. The layer of metalizing of the plates with oscillations on the fourth harmonic can be divided as is shown in Fig. 4. In Fig. 5 the scheme of combination of the electrodes of the resonator is depicted.

Four-electrode resonators can, in particular, find application

in a 12-channel multiplexing apparatus of the type B - 12. In this apparatus the separation of group carrier frequencies is carried out with the aid of 10 types of quartz filters for the frequency range 268 - 548 kc. In each filter there are seven two-electrode resonators with oscillations on the third harmonic. The utilization of the four-electrode resonators described in filters of the apparatus B - 12, designed for separation of currents of group carrier frequencies, makes it possible to considerably decrease the dimensions of the filters and their cost.

The technology of preparing four-electrode resonators with oscillations on the second and fourth harmonics is no more complex than the technology of preparing resonators with oscillations on a third harmonic; moreover, no additional consumption of raw materials is required, while their cost does not exceed the cost of resonators of other types used in quartz filters of apparatuses for long-range communications.

In Fig. 6 a four-electrode quartz resonator with longitudinal oscillations on the second harmonic is represented. It was prepared in the experimental shops of the Scientific Research Institute of the Ministry of Communications USSR.

A characterization of a filter with four-electrode resonators, designed for the separation of group carrier frequency of 340 kc, measured at normal and increased temperatures, is presented in Fig. 7. This characterization is not distinguished from the characterization

of analogous filters with two-electrode resonators, and satisfies the technical requirements.

Z. Ya. Gel'mont, senior engineer of the NIITSa

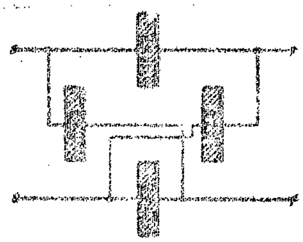


Fig. 1.

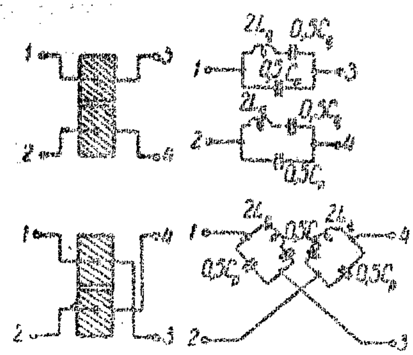


Fig. 2.

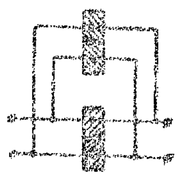


Fig. 3.

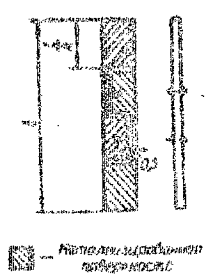


Fig. 4.

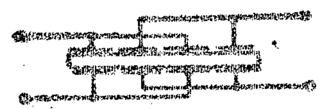


Fig. 5

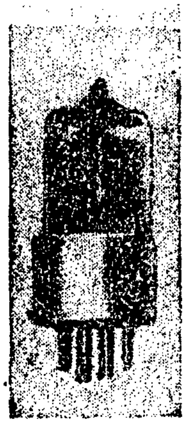


Fig. 6.

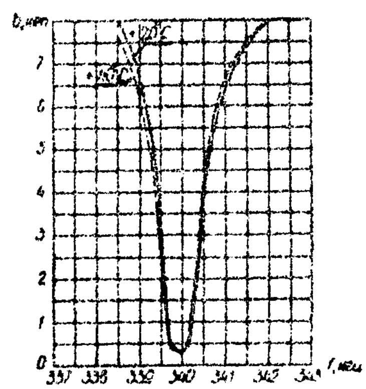


Fig. 7.

PROBLEMS OF THE ECONOMY OF ELECTROENERGY AT

RADIO BROADCASTING STATIONS

In the article the great significance of a consideration of the specific consumption of electroenergy at radio broadcasting stations is shown; ways are planned for lowering this consumption.

Certain workers of radio broadcasting stations believe that efforts toward economy of electroenergy can lead to undesirable results: the power emitted and the depth of the modulation will be lowered. A basic error in such considerations consists of the fact that the absolute consumption of electroenergy, rather than the specific consumption, is taken as the basis.

The following ratio should be considered as the specific consumption of electroenergy:

$$p_{уд} = \frac{P_{потр}}{P_к \left(1 + \frac{m_{ср}^2}{2}\right)},$$

where P_c is the power of the carrier frequency; m_{av} is the average coefficient of modulation; P_{req} is the power required by the transmitter, where

$$P_{потр} = P_{ГМ} + P_{пост}.$$

Here P_{GM} is the power delivered to the output stage of the generator and to the modulator (this power varies for modulation in trans-

mitters with anode modulation, in which the modulators work in a class B system, and does not depend on the modulation in transmitters with grid modulation, the modulators of which work in a class A system); P_{req} is the power delivered to all the remaining elements of the transmitter.

Let us consider this problem for the example of a transmitter with anode modulation; then P_{GM} can be computed according to the formula

$$P_{\underset{GM}{\Gamma M}} = P_{\underset{G}{\Gamma}} + P_{\underset{M}{M}} = \frac{P_{\text{н}c}}{\eta_{\Gamma_G}} + \frac{P_{\text{н}_c} m^2}{2\eta_{\Gamma}\,\eta_M\,\eta_{\text{тр}_{Tr}}} = \frac{P_{\text{н}}}{\eta_{\Gamma_G}}\left(1 + \frac{m^2}{2\eta_M\,\eta_{\underset{Tr}{\text{тр}}}}\right).$$

where η_G is the efficiency of the power stage of the generator; η_M is the efficiency of the modulator; η_{Tr} is the efficiency of the modulated transformer. Let us take $\eta_G = 0.7$; $\eta_{Tr} = 0.9$; $\eta_{M max} = 0.6$; $\eta_M = m\eta_{M max}$; then

$$P_{\underset{GM}{\Gamma M}} = \frac{P_{\text{н}c}}{0{,}7}\left(1 + \frac{m}{2\cdot 0{,}6\cdot 0{,}9}\right) = 1{,}43\ P_{\text{н}_c}(1 + 0{,}92\,m)$$

$$P_{\underset{Req}{\text{потр}}} = 1{,}43\ P_{\text{н}}\ (1 + 0{,}92\,m) + P_{\text{пост}\cdot Req}$$

$$P_{\underset{SP}{\text{уд}}} = \frac{1{,}43\ P_{\text{н}_c}(1 + 0{,}92\,m) + P_{\text{пост}_{Req}}}{P_{\text{н}_c}\left(1 + \frac{m^2}{2}\right)} \qquad (1)$$

For transmitters with anode modulation, for which a norm of the specific consumption has been established, equal to 3.5,

$$P_{норм} \approx 1,8\, P_{н},$$

and formula (1) takes on the form

$$P_{уд} = \frac{1,8\, P_{н} + 1,43\, P_{н}\,(1 + 0,92\, m)}{P_{н}\left(1 + \frac{m^2}{2}\right)} = \frac{3,23 + 1,32\, m}{1 + 0,5\, m^2}.$$

From the graphs of Figs. 1 and 2 it follows that with a change in the magnitude of the modulation coefficient, the specific consumption of electroenergy also changes. When m is lower than 20 percent and higher than 40 percent, the transmitter works in a more economic system than when m — (20 - 40) percent.

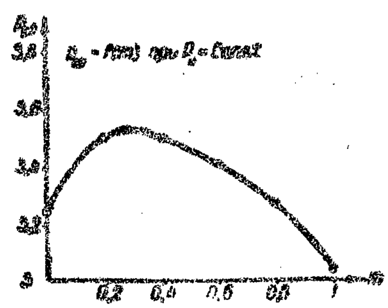


Fig. 1

The specific consumption of energy also varies with the change in the oscillatory power of the carrier frequency. This can readily be understood: with an increase in it the requirement of the power stage increases, but P_{req} does not change, and the specific consump-

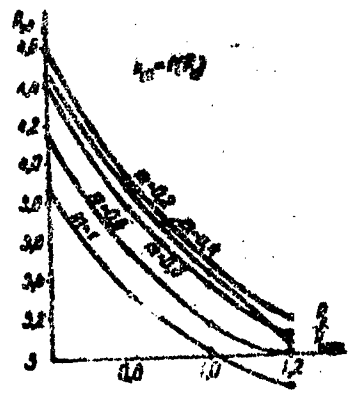


Fig. 2

tion drops. A decrease in the power of the carrier leads to an increase in the specific consumption. Thus, with an increase in the power of the carriers, the system of work of the transmitter becomes more economical, in spite of the fact that the absolute requirement of electroenergy increases.

Hence, if the metering of the average modulated high-frequency energy is adjusted, then not only the economic but also the qualitative aspect of the work of the transmitter can be controlled. Thus, with a high power of the carrier frequency and a deep (more than 40 percent) modulation, the magnitude of the specific consumption will be small, i.e., the transmitter will work in an economical system.

What norms of the specific energy consumption, according to which it would be possible to evaluate the economy of the work of the transmitter, should be taken?

Practice has shown that the average monthly coefficient of the

depth of the modulation on radio broadcast programs comprises approximately 35 percent. Proceeding from this quantity, we must establish a norm for the specific energy consumption

$$p_{уд} = \frac{P_{помр}}{P_{н}\left(1+\frac{m^2}{2}\right)}$$

and when m = 35 percent

$$p_{уд} = \frac{P_{помр}}{1.06\,P_{н}}$$

It is entirely possible that the quantity p_{sp} will have to be further corrected.

A practical realization of metering of the electroenergy in radio broadcasting transmitters is possible in the following way. For a transmitter of each type a norm of the specific consumption is established, taking the general energy supplied at a normal power of the carrier frequency and m = 35 percent. Then a metering of the average modulated emitted high-frequency energy should be organized, first using for this purpose, for example, well-known apparatuses, and then passing to more perfected models -- viz. high-frequency energy meters.

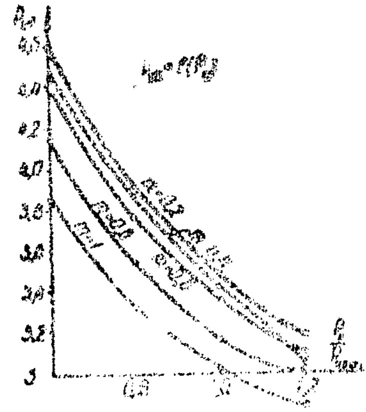
Then it is easy to calculate the specific energy consumption for a definite period of time and to compare it with the normal specific consumption

$$\frac{P_{уд\,ср}}{P_{уд\,норм}} = \alpha,$$

where α is the coefficient of energy consumption. This coefficient characterizes the economy of the work of the transmitter: the smaller α, the more economical its work.

The average modulated high-frequency energy is computed according to the expression

$$P_{н\,ср}\left(1+\frac{m^2_{ср}}{2}\right)t = W_{ср.мод},$$



where $P_{c,av}$ is the average power of the carrier frequency, M_{av} is the average modulation coefficient, and t is the time.

In the Kuybyshev management of radio broadcasting and radio communications, two apparatuses for metering $W_{av,mod}$ were constructed. One of them is based on the scheme of the blocking generator, the anode circuit of which includes a pulse meter.

As is well known, current of the pulse form flows in the anode circuit of a blocking generator. The frequency of repetition of the pulses depends on the quantitities R and C. Engineer I. R. Dobryenskiy proposed that a voltage source be included in sequence with R (Fig. 3). As was proven, the frequency of repetition of the pulses is found to be in direct dependence on the average value of

this voltage.

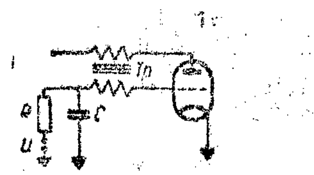


Fig. 3

The metering device included in the anode circuit will sum the values of the voltage after any period of time, and moreover the quotient of division of the meter reading by t gives the average value of the voltage u. With the aid of such a meter it is possible to compute the average value of the depth of the modulation and the energy in the feeder, if a pickup of the modulation (modulometer) and power is included in the apparatus.

The apparatus possesses the shortcoming that when u = 0 the meter continues to count pulses, the frequency of repetition of which depends only on R and C. Hence in practice we must use graphs calculated for a definite interval of time. Unquestionably the apparatus should be perfected in such a way that the counter would work only when a voltage u is applied. However, such an apparatus can already be fully utilized. Its complete scheme is presented in the information bulletin of the Moscow management of radio communications and radio broadcasting for 1956.

Another apparatus, proposed by engineer L. M. Kuvshinov, re-

presents a high-frequency power pickup; its circuit is depicted in Fig. 4. Here CT is the current transformer, included in the feeder or antenna; $u_1 = C_1 U_{mf} \sin \omega t$ is the voltage, proportional to the voltage at the feeder, $u_2 = C_2 I_{mf} \sin(\omega t + \phi)$ is the voltage proportional to the current in the feeder.

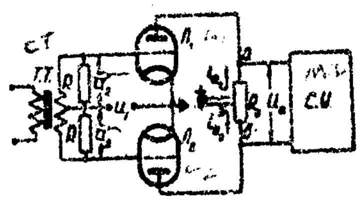


Fig. 4.

The sum of voltages $u_1 + u_2$ is supplied to the circuit of lamp L_1, while the voltage difference $u_2 - u_1$ is delivered to the network of L_2. The system of the lamps is selected so that their work takes place on the quadratic portion of the performance curve. Then the expression for the anode currents will have the following form:

$$i_{a1} = I_{01} + C_3 (u_1 + u_2)^2,$$
$$i_{a2} = I_{02} + C_4 (u_2 - u_1)^2.$$

The elements of the scheme should be selected in such a way that both branches will be symmetrical; then $I_{01} = I_{02}$ and $C_3 = C_4$.

The voltage between points a and b is equal to

$$u_a = (i_{a1} - i_{a2}) R_a.$$

Substituting the values of i_{a1} and i_{a2} and performing a transformation, we obtain

$$u_a = 2R_aC_1C_2C_3I_{m\phi}U_{m\phi}\cos\varphi - 2R_aC_1C_2C_3I_{m\phi}U_{m\phi} \times \\ \times \cos(2\omega t + \varphi).$$

The second member of the last expression represents the high-frequency component of the voltage, which can be filtered out by bypassing R_a with capacitance. The magnitude of this capacitance should be taken from the condition

$$R_a \gg \frac{1}{2\omega C}.$$

Then

$$u_a \approx CI_{m\phi}U_{m\phi}\cos\varphi,$$

where $C = 2R_aC_1C_2C_3$.

It is evident that the voltage u_a is proportional to the total high-frequency power in the feeder. This voltage can be supplied to the metering device MD, for example, to the metering device on a blocking generator.

The introduction of the devices described into radio broadcasting stations permits the adjustment of the metering of the specific consumption of electroenergy and the improvement of the control of the work of the transmitters. —I. I. Seleznev, engineer.

THE CENTRAL SCIENTIFIC RESEARCH INSTITUTE OF COMMUNICATIONS (TsNIIS)

AND ITS DIVISION IN KIEV (KONIIS)

announced enrollment in the graduate courses for 1958

Work Being Discontinued in the Specialties:

TsNIIS (in Moscow): long distance communications; theoretical foundations of electrotechnology (energetics of communications enterprises);

KONIIS (in Kiev): long distance communications; telegraphic communications; line-cable communications equipment.

Persons up to 35 years of age who have completed their higher education and have practical work experience in a selected scientific speciality of no less than two years are accepted in the graduate course.

The applicant should attach in duplicate to his application for acceptance in a graduate course: a personal list for consideration of the staff, an autobiography, a detailed political and business characterization from the last place of work, a paper on the selected specialty, references to scientific papers and inventions, a notarized copy of the diploma with an excerpt from the examination record, information on the state of health with indications of the possibility of training in a graduate course, and photographs. Acceptance of applications will take place until 15 August.

Entrance examinations will be conducted in Moscow from 1 to 20

October. Persons accepted for the examinations will be provided with a month's paid leave from their place of work for preparation for taking the examinations in a specialized field, in the fundamentals of Marxism-Leninism, and in a foreign language on the level of the programs of the technical colleges.

Persons enrolled in the graduate course will be released from work and guaranteed stipends of the size of the pay they have been obtaining, but no higher than 1000 rubles per month. Boarding houses are provided in Moscow and Kiev only for the students from other cities. Studies will begin on 1 December.

Applications and questions should be directed to the address: Moscow, E-43, 1 Parkavaya Street, d. 7-a; telephone E5-00-11, ext. 2-13.

ON METHODS OF LONG-RANGE PLANNING OF THE NETWORK OF INTERURBAN TELEPHONE COMMUNICATIONS

According to the resolution of the central committee of the KPSS and the council of ministers of the USSR, the draft of the long-range plan for development of the national economy in 1959-1965 should be completed by 1 June 1958. In accord with this resolution, a plan of development of communications, including interurban telephone communications, is being drawn up for this same period. In the compilation of a long-range plan of development of interurban telephone communications both for the individual economic rayons and republics and for the entire Soviet Union as a whole, it is essential to determine: 1) the need for interurban telephone communications and 2) the required volume of communications media, i.e., the number of communications channels, depending on their type and method of service.

Determination of the need for interurban telephone communications. The need for interurban telephone communications is basic for the construction and development of an interurban telephone network. This need should be characterized not only by the telephone load of individual interurban stations, but also by the telephone currents in individual routes.

The determination of need should be made not only at this moment but also for the planned period. There are no scientifically based methods for planning the need for interurban telephone communications, nor is there any systematic study of interurban telephone currents which would have made it possible to proceed more correctly to the solution of this problem.

One of the variants of the methods of long-range planning of the need for interurban telephone communications is the method of calculation of the telephone currents, the essence of which consists of revealing the relationships (in the form of coefficients) between telegraph and telephone currents in certain routes where it is possible to consider approximately that the need for telegraph and telephone communications is fully satisfied, and of applying these coefficients to the calculation of telephone currents in analogous routes.

But the indicated method does not answer sufficiently the problem of determining the need for telephone communications, since it is not known what the relationships between the growth of telegraph needs and the growth of telephone needs will be, and it is not known whether the growth of the need for telephone communications will always correspond to the growth of the need for telegraph communications.

As another method for determining the outgoing telephone currents, a method can be proposed which is based on a study of the need

for interurban communications of the economic rayons and an analysis of the gravitation between economic rayons. The essence of this method is the following.

The principal users of interurban telephone communications are the subscribers of the city and interrayon telephone networks (they include up to 85 percent of the entire exchange). Hence, if the average number of outgoing interurban telephone conversations for one subscriber of the GTS (city telephone network) per day (c_m), the average number of outgoing interurban telephone conversations for one subscriber of the VRS (intrarayon telephone communications) per day (c'_m), the number of subscribers of the GTS (N_{GTS}), and the number of subscribers of the VRS (N_{VRS}), are known, then taking into consideration the number of conversations (ΔC) which are conducted from public telephones, it is possible to calculate the daily outgoing interurban exchange of a given point $C_{outgoing}$:

$$C_{out} = c_{м} N_{ГТС} + c'_{м} N_{ВРС} + \Delta C.$$

The calculation of the required capacity of the GTS, as we know, is performed according to the individual groups of consumers -- for the public, for institutions, and for commercial establishments. In this way the calculated norms of the number of telephone apparatuses for individual groups of users are established, and then, proceeding from the economic and numerical growth of the population, the general need for telephones in the city is determined for the projected period.*

* This problem is most fully considered for the GTS in the book of Ye. V. Markhaya, "Fundamentals of Technical Economic Planning of City Telephone Networks," Communications Publishing House, M., 1953.

When such a method of calculation is used, the capacity of the GTS sufficiently well reflects the economics of cities, as a result of which the number of users of interurban telephone communications will also be determined most correctly.

Furthermore, the number of outgoing interurban telephone conversations per day for one subscriber of the GTS ($c_{m_{pl}}$) must also be projected to the end of the calculated period. For this it is first necessary to determine the average number of conversations per day for a subscriber at a given moment, c_m. For this it is necessary to take into consideration the fact that c_m for cities of various types, depending on the capacity of the station equipment of their GTS and the structural composition of the users (specific importance of neighborhood and institutional telephones), differs.

Knowing the average number of conversations for one subscriber per day (c_m) existing at the present time, the average number of conversations per day for a subscriber for the calculated period for a given city ($c_{m_{pl}}$) is established, and then, proceeding from the number of subscribers N in the city, the planned outgoing exchange of this city, $C = c_{m_{pl}} N$, is determined.

The interurban telephone exchange for the VRS is also determined in an analogous manner.

By determining the exchange for each city and rayon, the total exchange is also established according to the economic administrative rayon $(\sum c_i)$.

Projection of the coefficient of gravitation of certain cities or rayons to others is necessary for planning of interurban telephone currents between cities in an economic administrative rayon and between the economic administrative rayons themselves. For this purpose a preliminary study is made of the existing currents between cities or rayons, and according to these data a table is compiled, in the horizontal lines of which the magnitudes of the outgoing currents (per day) are indicated, while in the vertical columns the ingoing currents are indicated.

К району (To rayon) / От района (From rayon)	А	Б	В C
А	$C_{\text{А–А}}$	$C_{\text{А–Б}}$	$C_{\text{А–В}}$
Б	$C_{\text{Б–А}}$	$C_{\text{Б–Б}}$	$C_{\text{Б–В}}$
В C	$C_{\text{В–А}}$ C	$C_{\text{В–Б}}$ C	$C_{\text{В–В}}$ C
Total Итого	$C_{\text{А}}$	$C_{\text{Б}}$	$C_{\text{В}}$

On the basis of these data the coefficients of gravitation $(f_{A-B}, f_{A-C}, f_{A-A})$ of each economic rayon to all the rest are determined.

The coefficient of gravitation, for example, of rayon A to rayon B, is determined according to the following formula:

$$f_{A-B} = \frac{\frac{C_{A-B}}{C_A}}{\frac{C_B}{C}} = \frac{C_{A-B}C}{C_A C_B},$$

where $\frac{C_{A-B}}{C_A}$ is the specific weight of the outgoing current of the rayon A to rayon B in the entire exchange C_A of rayon A; $\frac{C_B}{C}$ is the specific weight of the entire exchange C_B of rayon B in the total exchange C of all the rayons between which the interurban telephone communications are organized.

The other coefficients of gravitation are determined analogously:

$$f_{A-C},\ f_{A-A},\ f_{B-A},\ f_{B-C},\ f_{B-B},\ f_{C-A},\ f_{C-B},\ f_{C-C}.$$

Proceeding from the actual coefficients of gravitation, the coefficients for the end of the planned period should be planned on the basis of a consideration of prospects of development of the economy in the rayons and cities and of the growth of needs for interurban telephone communications.

We should note that the gravitation between economic rayons can also be determined with the aid of a study of telegraph currents.

After the outgoing telephone exchange for each rayon and city and the coefficients of gravitation between them have been projected, the magnitudes of interurban telephone currents can be planned, for example,

$$C_{A-B\,\text{ns}\atop pl} = l_{A-B\,\text{ns}\atop fi} \frac{C_{A\,\text{ns}}^{pl}\, C_{B\,\text{ns}}^{fi}}{C_{\text{ns}\atop fi}}.$$

All the projected magnitudes of telephone currents between rayons or cities are cited in a general table. They are the basis for the construction of an interurban telephone network, in particular, for the calculation of the number of channels and for subsequent determination of the volume of telephone communications media.

Calculation of the number of channels. After the telephone currents have been planned for the individual routes between points, it seems possible to determine the number of channels in these directions in conformity with delay-basis operation and "no delay" service.

For delay-basis operation. As is well known, in delay-basis operation, the operating utilization of the channel comprises $U = 100$ percent and remains constant for any number of channels N in the beam. Hence, by knowing the average time that the channel is occupied for one conversation $t_k = t_p + t_{ok}$, where t_p is the length of the pure conversation and t_{ok} is the expenditure of working time for one conversation for a given channel, it is possible to determine the number of conversations transmitted along the channel during the busy hour, namely

$$c_{\text{свн}\atop b.h.} = \frac{60}{t_k} =$$

$$= \frac{60}{t_p + t_{ov}} .$$

Proceeding from the exchange along the channel during the busy hour c_{bh}, it is easy to determine the exchange along the channel for a day by using the formula

$$c_{cym} = \frac{c_{ЧНН}}{K} ,$$

where K is the coefficient of concentration of completion of the occurring bookings of calls. This coefficient depends on the maximum permissible waiting time τ, where the smaller τ is the larger K.

After analyzing the graph of entering and completion of bookings for various waiting times, it is possible to express the dependence between K and τ graphically (Fig. 1). In practice, when bookings are completed if possible in a definite sequence, the calculated dependence depicted on the graph can be violated. Hence the coefficient of concentration of completion of the load of interurban telephone switchboards should be established by utilizing actual data taken for a small waiting time.

Hence if the number of conversations C_i transmitted per day in a definite route is known, then the necessary number of channels N_i for given t_k and K will be equal to

$$N_i = \frac{C_i}{c_{cym}} .$$

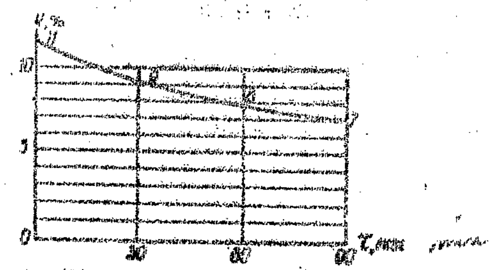


Fig. 1

For no-delay service. In this case, in the calculation of the number of channels which should be available in one route or another, it is necessary to take into consideration the fact that the degree of utilization of the channel U does not remain constant, but varies depending on the load $y_i = C_i t_k$ entering the route, and on the given quality of service P (> τ). The number of channels for various loads is determined according to the nomographs of Ye. N. Bukhman, and according to the numbers found, a graph of the variation of the number of channels as a function of the load during the busy hour and of the index of the quality of service is constructed. On these graphs the dependence of the number of channels on the route and on the daily number of conversations for a given average conversation length t_p should also be shown.

Selection of the operating system. In long-range planning the necessity arises of determining under what conditions — distances and number of channels between points — it is economically expedient to change to "no delay" service.

A basic indicator of the effectiveness of change to no-delay service is the cost price of a unit of production; in this case a conversation transmitted over a definite distance is taken as the unit of production. Hence the transfer will be expedient when for the same distance of transmission of the conversation its cost price for no-delay service ends will be less than or at least equal to the cost price of a conversation in delay-basis operation e_{dbo}, i.e., when $e_{nds} \leq e_{dbo}$.

The cost price of a conversation e is made up of two components: a) the cost price of processing the booking of the call at the two ends of the channel in the switchboard rooms $e_{sw} = e_{out} + e_{in}$ and b) thecost price of transmission of the conversation along the channel e_{chan}; thur $e = e_{sw} + e_{chan}$.

The cost price of processing a booking for a call in the switchboard rooms, e_{sw}, does not depend on the distance and varies as a function of the system of operation, where for no-delay service it is smaller than for delay-basis operation: $e_{sw_{nbs}} \leq e_{sw_{dbo}}$.

The cost price of transmission of a conversation along the channel, e_{chan}, for delay-basis operation can be determined in the following way:

$$\underset{chan}{e_{кан}} = \frac{\overset{chan}{Э_{кан}}}{8760\, \underset{dbo}{\eta_{зак}}\, \underset{dbo}{c_{зак}}} = \frac{\overset{laz}{Э_{лаз}} + \overset{rs}{Э_{ур}} + Э_{магл}}{8760\, \underset{dbo}{\eta_{зак}}\, c_{зак}\ dbo}\ \ net$$

Here 8760 is the number of hours in a year, η_{dbo} is the coefficient of utilization of the channel per day (for delay-basis operation $\eta_{dbo} = 1/24K$, where K is the coefficient of concentration of load), c_{dbo} is the number of conversations on a given system along the channel during the busy hour, $Э_{chan}$ is the operating expenditures for a channel between two points at a distance L per year. $Э_{chan}$ is made up of the expenditures at the two ends of the terminal LAZ (line equipment rooms), $Э_{laz}$, the expenditures for operation of the repeater stations $Э_{rs}$, and expenditures for the operation of the air or cable physical networks, $Э_{net}$.

The operating expenditures $Э_{rs}$ and $Э_{net}$ constitute expenditures for the line $Э_{line}$, i.e., $Э_{line} = Э_{rs} + Э_{net}$. These expenditures for the line, $Э_{line}$, are directly proportional to the extent of the channels, and, consequently, can be expressed in the form ϵL, where ϵ are the operating expenditures made for one channel-kilometer per year. Hence, the cost price of a conversation for a channel can be represented in the form

$$\underset{chan}{e_{кан}} = \frac{\overset{laz}{Э_{лаз}}}{8760\, \underset{dbo}{\eta_{зак}}\, \underset{dbo}{c_{зак}}} + \frac{\epsilon L}{8760\, \underset{dbo}{\eta_{зак}}\, \underset{dbo}{c_{зак}}} = \underset{laz\ dbo}{e_{лаз\,зак}} + \underset{dbo}{\lambda_{зак}} L,$$

where λ_{dbo} expresses the expenditures for the line for one conversation-kilometer, depending on the type and density of the line.

Thus, the total cost price of a conversation in delay-basis operation comprises

$$\underset{dbo}{e_{зак}} = \underset{sw\,dbo}{e_{ком\,зак}} + \underset{las\,dbc}{e_{лаз\,зак}} + \underset{dbo}{\lambda_{зак}} L.$$

In the determination of the cost price of a conversation in no-delay service, it is necessary to take into consideration the fact that operational utilization of the channels in this case is $U < 100$ percent and does not remain constant as for delay-basis operation, but varies depending on the number of channels in the route or in the beam between points. The number of conversations along the channel during the busy hour, c_{nds}, varies accordingly.

In no-delay service the cost price of processing the booking of the call in the switchboard room, $e_{sw_{nds}} = e_{out} + e_{in}$, does not depend on L and on the utilization of the channel U.

The cost price of transmission of a conversation along the channel $e_{chan_{nds}}$ depends on the distance L and the number of channels N in the beam, and, consequently, on the utilization of the channel U.

This cost price is determined from the expression

$$\underset{chan\;nds}{e_{кан\,нез}} = \frac{Э_{лаз} + эL}{8760\,\underset{nds}{\eta_{нез}}\,\underset{nds}{c_{нез}}},$$

where η_{nds} is the coefficient of daily utilization of the channel in no-delay service, whereupon $\eta_{nds} = U/24K = \eta_{dbo}U$; c_{nds} is the number of conversations along the channel during the busy hour in no-delay service; since $U = c_{nds}t_K/60$, then

$$c_{\text{нсм}} = \frac{60U}{t_{\text{к}}} = c_{\text{зак}}U.$$

Substituting the values of η_{nds} and c_{nds} found into the expression indicated above for the cost price, we obtain

$$c_{\text{кан нсм}} = \frac{Э_{\text{зав}}}{8760\eta_{\text{зав}}c_{\text{зак}}U^2} + \frac{aL}{8760\eta_{\text{зав}}c_{\text{зак}}U^2},$$

or

$$c_{\text{кан нсм}} = c_{\text{абв зак}}\frac{1}{U^2} + \lambda_{\text{зак}}\frac{L}{U^2}.$$

Consequently, the total cost price is determined by the formula

$$c_{\text{нсм}} = c_{\text{ком нсм}} + \frac{c^{\text{м}}_{\text{абв зак}}}{U^2} + \lambda_{\text{зак}}\frac{L}{U^2}.$$

Furthermore, for one type or another of line equipment and systems of their multiplexing, let us determine the cost price of a conversation for service of the channels according to delay-basis operation and no-delay service at various distances and beams of the channels between points, and let us construct according to these data a number of graphs of the changes in the cost price. The points of intersection of the lines which characterize the cost price of the conversation in the case of delay-basis operation with lines which characterize the cost price for no-delay service indicate the number of channels N and the distance L above which use of the no-delay serv-

ice is not economically expedient.

In Fig. 2 graphs of the cost price e for an aerial main line, multiplexed by V-3 and V-12 apparatuses (Fig. 2a), and for a cable main line, multiplexed by a K-24 apparatus (Fig. 2b), are presented as examples. On the basis of these graphs a graph is compiled showing the region of effective application of no-delay service in the operation of the indicated channels (Fig. 2c).

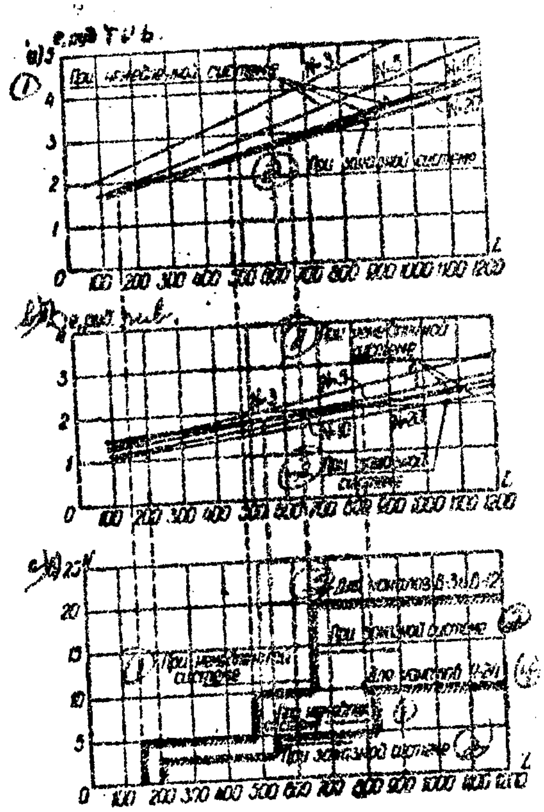


Fig. 2.
1. For "no delay" service; 2. For delay-basis operation; 3. For channels C-3 and C-12; 4. For channels K-24.

Similar graphs can also be constructed applicable to line equipment of other types. For example, in Fig. 3 the limits of effectiveness of communications operation in no-delay service for four different types of channels when P (> 10') = 10 percent are shown; i.e., if at a given L and N the point on the graph lies above one curve or another, then for the corresponding type of channels operation according to no-delay service is economically expedient.

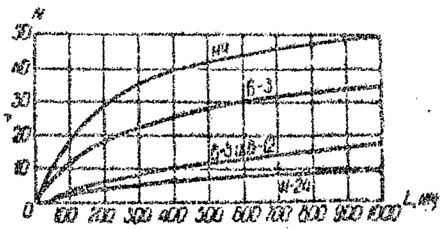


Fig. 3

The methods of planning interurban telephone communications proposed in this article are not universal. They should be considered as one of the variants of the solution of the problem of long-range planning of interurban telephone communications taking into consideration city and intrarayon telephone communications. This method can be used in projecting interurban telephone communications in individual economic rayons and republics.

M. G. Karmazov, candidate of technical sciences, docent of the MEIS (Moscow Electrotechnical Communications Institute)

AN HONORABLE TASK SUCCESSFULLY FULFILLED

Elections to the Supreme Soviet of the USSR took place in an atmosphere of great political and general enthusiasm. On 16 March the Soviet people singleheartedly cast their votes for the candidates in the elections of the highest organ of governmental power of our country.

The communications workers successfully handled the important and honorable tasks entrusted to them during this crucial period. It is related below by the example of Ivanovskaya oblast how the coverage of the election campaign was organized by the communications organs.

Long before the election day, the communications workers of Ivanovskaya oblast began to prepare for perfect coverage of the election campaign by all the communications media.

In the Ivanovo communications management an operating group in charge of deputy chief of the management V. A. Karasev was created to guide this work. The group worked out a plan of measures for coverage of the elections by all types of communications. Corresponding plans were also drawn up at the communications establishments of the oblast.

During the preceding election campaigns, telephone installation and radiofication of the electoral districts caused the communications workers of the oblast a great deal of trouble. Each time this work had to be begun anew, since many buildings where polling places were

situated had had telephone and radio facilities installed temporarily, only for the period of the elections. This time the situation was changed. The Ivanovo communications workers accomplished this by conducting planned work from year to year between the election campaigns with the aim ~~in mind~~ of installing telephones in those population points where the polling places were always organized. Lines were strung here beforehand, and when necessary it remained only to set up telephone apparatus or to rearrange it. The oblast management and the rayon communications offices paid especial attention to installing telephones in remote electoral districts. For example, telephone facilities were installed at the population point Mamontovo, where a polling place was organized, situated 50 kilometers from the rayon center and 240 kilometers from the oblast center.

As a result of the work done in the past years, all 872 polling places organized in Ivanovskaya oblast, had telephone communications with their electoral neighborhoods during the current election campaign. This time, as a rule, it was not necessary to enlist for this purpose the communications media of other departments.

The operational group worked out in detail schemes for inter-urban telephone-telegraph communications guaranteeing high-quality communications of all the electoral districts and their district election committees for the election of the Supreme Soviet of the USSR in the Soviet Union (five such committees) and the district committees for the election of the Supreme Soviet of the USSR in the Soviet of

Nationalities. Each electoral district was provided with service by several communications channels. In case of damage to the continuous communications, a series of indirect communications was established. Many rayons of Kostromskaya and Vladimirskaya oblasts, included in the sixth electoral district for election in the Soviet of Nationalities, arranged for the possibility of communicating with Ivanovo by telephone, bypassing the oblast center.

Engineer of the LAZ of Ivanovo GMTS, A. M. Pisarev at the tuning of the newly opened interurban channel for communications with the district election committee in the city of Teykov.

In addition, schemes and graphs of the election and deliveries of documents on the totals of the voting in the Supreme Soviet from

each electoral district to the rayon center, from each rayon center to the district election committee, and from the latter to the central election committee were worked out. All the schemes and graphs were considered and approved by the oblast executive committee; the operations group of the oblast communications management maintained active daily contact with it and with the six electoral districts for the elections in the Soviet of Nationalities.

During the period of the elections it was especially important to guarantee continuous operation of all the line facilities. For this purpose special bypasses of the interurban telegraph-telephone communications lines were organized by the superintendents and chiefs of the line sections.

The arrangement of superintendents and technical personnel of the line-technical junctions and communications offices, as well as utilization of the transport media for servicing the interurban telephone-telegraph communications lines in case of breakdown during the crucial period of the elections and collection of reports from the electoral districts, was planned by a separate scheme.

On the initiative of the operations group special blank forms for telegraphic transmission of reports on the results of the voting for each electoral district were printed at a local printing house.

In addition to active instruction of the workers of the rayon offices and communications divisions on problems of election coverage by the communications media, the oblast management conducted a special

conference with them by DGTS (duplex conference call).

At all the communications establishments of the oblast the workers were instructed on the order of processing and transportation of election correspondence, parcels, and telegrams, and on service to the interurban telephone conversations by "election" calls, etc.

The collective of the Ivanovo postal telegraph office worked very well during the days of the election campaign. The reception, processing, remittance, and delivery of letter correspondence, parcels, and stamps with the marking "election" were performed out of turn and without the slightest delay. In the working rooms of the office and urban communications divisions notices were posted of the reception of all such postal dispatches out of turn.

The workers of the office and city divisions accurately delivered printed matter and correspondence to the campaign center. The directors of the office took measures for expanding the delivery of the postal divisions carried out according to the GSP system from three to five circuits, as a result of which the GSP system thus encompassed about 250 establishments and institutions of the city. This permitted the organization of efficient service of a number of campaign centers by the urban official mail. In the rest of the campaign centers and electoral districts printed materials and correspondence were delivered by the mailmen in special deliveries.

The collective of telegraph workers expeditiously processed and rapidly delivered all the election telegrams. Continuous control of

their receipt and transmission was established -- either by controllers of especially important telegrams or (in their absence) by the placements chiefs. The transmission of each election telegram was noted in a special journal.

On the day before the election telegraph communications were opened with the electoral district number six for the election in the Soviet of Nationalities. Transmission of telegrams according to the schemes from the rayons of the oblast to the oblast executive committee were checked in advance.

A great deal of work on election service was performed by the collective of the Ivanovo urban and interurban telephone station (GMTS). A careful check and synchronization of interurban telephone channels connecting the centers of the electoral districts with the interurban telephone stations was made. All the equipment of the station was also checked and fully put in order. At the beginning of March, checking of telephone communications in the scheme of their organization on the election day was carried out. Workers of the GTS installed telephone facilities on the premises of the polling places in each oblast center and in the rural rayon adjoining the city of Ivanovo. The superintendents and line technicians were entrusted with the task of examining the subscriber installations at all the polling places. From the terminal room of the GTS the quality of audibility of telephone conversations from the polling places was periodically checked. The technical personnel of the rayon communications offices

also ran daily control checks on the audibility of telephone conversations with the district electoral committees, and the results of the control were written down in a journal. Special precautionary examinations of the telephones of the district electoral committees and of organizations connected with running the elections were performed.

Chief of the switchboard room of the Ivanovo GMTS, Ye. P. Smirnova, checks the service of booking of interurban calls with the "elections" code word by telephone operator N. O. Safiullinsya.

Radio workers took care of everything necessary for guaranteeing high-quality operation of the radiofication media during the election campaign both in the oblast center and in all the population points. All the campaign centers, polling places, and district committees had radio. The radio junctions operated continuously, and the sound was good. In such large centers of the oblast as Ivanovo, Shuya, Kineshma, Vichuga, Teykovo, and others, amplification of the

speeches of orators at the pre-election meetings was organized.

The communications workers of the oblast distributed about 18,000 copies of books, brochures, and posters issued for the election.

The Ivanovo communications workers also participated actively in mass agitation work among the voters. Thus, for example, one of the district election committees of the city of Ivanovo was formed by the communications workers. They did a great deal of work in the electoral district itself and in the campaign center connected to it. In the rayons of the oblast many communications workers were selected as members of election committees and worked as agitators.

* * *

In the four years which have passed since the last elections in the Supreme Soviet of the USSR (1954) marked changes have occurred in the communications economy of Ivanovskaya oblast. The network of urban and rural communications establishments has been expanded. All types of communications have been developed and improved. The establishments of the oblast and rayon centers have been equipped with new techniques and devices of mechanization. In comparison with 1954 the receipts of the communications establishments have increased by more than 30 percent, the volume of communications production by 23 percent, the work efficiency by 15 percent. In addition, in 1958 the Ivanovo communications workers (chief of the oblast management A. Ya.

Nefedov) have achieved successful fulfillment of all the work quotas and have made marked improvements in the qualitative indications of their work. This has spoken favorably of the organization of service for the elections to the Supreme Soviet of the USSR.

In preparation for the elections, the communications workers of Ivanovo widely developed socialist competition. The duties which the collectives and individual workers took upon themselves included not only measures for the development of service for the election campaign, but also directions for surpassing the work quotas, increasing the quality of work, and improving the service to the population.

As a result of the competition, the collective of the Ivanovo postal-telegraph office gave receipts of 655,000 rubles above the quota last year. The quota of receipts for the first months of this year has also been successfully fulfilled. The quota for distributing printed matter both by subscription and on a retail basis has also been surpassed. The work efficiency increased by 2.6 percent in comparison with 1946, which was promoted to a great degree by the installation of mechanization devices in the office. In the days of preparation for the election the premises of the six city communications divisions were refitted and placed in an operating condition. Two city communications divisions and one division in Ivanovskiy rayon were transformed into model divisions with the aid of the workers of the office. The collectives of the other communications divisions are following the example of these divisions.

Substantial changes have occurred in the telegraph as a result of the labors of its workers. The station has been equipped with a subscriber telegraph ATR-10/20. The telegraph workers were pledged to automate the telegraphic communications with a high-speed system for the forty-first anniversary of October; competing in honor of the elections in the Supreme Soviet of the USSR, they have already fulfilled much of the planned work. Eight telegraph workers are being trained in technical communications services. The qualitative indexes of the telegraph work are being improved.

Brigadier A. I. Shmeleva formulates a received election telegram.

Many of the collectives of the rayon communications offices of the oblast have met the elections with productivity successes. As an example we can cite the Shuya communications office. Here the quota of receipts for the first months of this year has been fulfilled, as

have the work quotas for subscription to printed matter and retail distribution of printed matter. The qualitative indexes, in comparison with the corresponding months of last year, have changed for the better.

On the eve of the elections an important event for the Ivanovo communications workers took place -- the task of the party and government of completing rural radiofication in four years was successfully fulfilled by them. At the beginning of January of this year the number of radio receiving sets per 100 rural inhabitants was 19 (15 were planned according to the quota).

The collective of the DRTS has successfully fulfilled a number of obligations assumed in honor of the elections for the first quarter of 1958. Thus, the quota for growth of radio points has been surpassed. New equipment for automatic direction of the Ivanovo radio junction has been put into operation, which has improved the quality of its work. The quota of replacement of worn-out wires on the networks of radiofication and the VRS allotted for the first quarter has been fulfilled, as has 35 percent of the yearly quota of repair of radio points. In the cities of Yuzhe and Kineshmo television relay facilities have been set up.

By the day of elections, all telephone communications in Ivanovskiy rayon of the oblast had been automated. At present 77 percent of the kolkhoz of the oblast have telephone communications. The Ivanovo communications workers in the future will apply all their strength to installing telephone facilities in all the kolkhoz and

helping them to organize intra-industrial telephone communications.

The communications workers of the oblast have created by their labors conditions guaranteeing model communications service. Let us name the best of them: telegraph workers K. M. Semenova and R. N. Solov'yeva, telegram deliverer Ye. N. Smirnova, postal brigade headed by P. L. Volodinaya, telegraph technician P. K. Komlyukhin (postal telegraph office), technicians I. S. Khakhulin and Ye. T. Kabantsev, superintendents I. P. Kurayev and V. K. Malinin, telephone operators T. I. Lyamina and S. I. Varlamova (urban and interurban telephone stations), and technicians of the Shuya MTS, P. S. Khryashchev and Ye. P. Sveshnikov.

Postal agent L. I. Gracheva takes a parcel with election materials.

In the area of radiofication of agricultural localities, in the improvement of the quality of broadcasting, and in model election serv-

ice, a great deal of work was performed by superintendents I. T. Bormotin, K. S. Simontsov, D. V. Sharagin (Ivanovo radio junction), G. V. Turkin (Yuzhe communications office), A. D. Khryashchev (Shuya radio junction), G. F. Belyayev (chief of the Kineshma radio junction), I. V. Marukhin, A. F. Detkin and B. F. Sharov (SMUR), Y. D. Dobrokhotov, K. A. Novozhilov (director of the Yur'yevetskiy and Verkhne-Landekhovskiy rayon communications offices), chief of the DRTS A. A. Korovaykov, chief engineer of theDRTS I. P. Solov'yev, chief of the SMUR M. A. Zyablikov, etc.

Careful preparation for the election day led to the desired results. On the election day service of the district and circuit committees by the communications media was organized efficiently and effectively. Telegraph workers, telephone operators, superintendents, postal workers, technicians, engineers — all who were called upon to serve the elections on this day were especially alert to fulfill the honorable task entrusted to them with enthusiasm.

The communications workers of the oblast conducted themselves honorably in the tasks entrusted to them of guaranteeing elections communications. Their work was highly valued by the election committees, as well as by the party and Soviet organizations.

All reports on the appearance of voters for the voting and on the results of the elections were obtained by the oblast executive committee and the district election committees considerably earlier than the appointed time. Reports from all the district election com-

mittees to the circuit committees also were delivered promptly. To expedite delivery of materials with the totals of the voting, airplanes over routes worked out earlier were used.

The communications workers who most distinguished themselves during the days of preparation and conduct of the elections were presented for commendation by certificates of the oblast executive committee. The communications workers of the oblast are applying all their efforts for further development and perfection of the communications media, improvement of the quality of the work, and of the efficiency of service to the workers.

Line superintendent of the Ivanovo GMTS, V. K. Malinin, installs a telephone at a polling place.

COMMUNICATIONS WORKERS OF ELEKTROSTAL'

Elektrostal' is a city of metallurgists located near Moscow. It is one of the important industrial centers of the country, with large businesses and many thousands of inhabitants. The communications office of the city (an establishment of the third class) occupies one of the leading sites in Moskovskaya oblast. But another thing is also remarkable here: of the 122 communications workers of this establishment, 115 are women. Among them are the chief of the office, her deputy, the section leaders, and workers in all the basic processes.

The Elektrostal' communications office is situated in one of the finest buildings of the city.

The solid, industrious collective of communications workers of

the office is successfully coping with the tasks set before them. They have accomplished a great deal of work. Here are a few figures characterizing the outgoing exchange by mail, telegraph, and telephone. During 1957 the communications workers of Elektrostal' sent about 1,300,000 letters and postcards, more than 112,000 money orders, 52,000 parcels, 63,000 telegrams, and provided the population with more than 33,000 interurban telephone conversations. All these figures considerably exceed the work quotas planned for the past year. We should add that the workers of the city are supplied each day with a great number of postal services and printed matter.

From day to day the communications workers of the city are improving the qualitative and quantitative indices of their work. They fulfilled the yearly quota of receipts, planned for 1957, by 102.5 percent. The receipts cleared by the communications office in all divisions last year constituted on the whole 4,372,000 rubles and exceeded the expenditures by almost 3.5 million rubles. The communications office is a paying concern.

The collective guarantees complete safekeeping for valuables entrusted to it. All mail is delivered. Complaints of the workers about the postal service are becoming fewer and fewer.

Of course all this is not accidental. The collective of communications workers applies itself very conscientiously to its work and strives to serve the workers, the technical intelligentsia of the factories, and all the rest of the population of the city efficiently

and as fully as possible.

The communications workers render supplementary communications services to the workers of the city. In addition to the fact that each postal agent recommends these services to his clients, in the operations room a special table is equipped with supplementary communications services. In 1957 receipts from the supplementary communications services comprised more than 23,000 rubles instead of the planned 20,000 rubles.

The improvement of service to the population and the fulfillment of the work quotas is promoted by socialist competition. The entire collective of the office takes part in it. Here they compete for the titles "best division," "best city communications division," "best in the profession," and individual competition has developed. In addition social control over the fulfillment of duties and quotas has been well established in the collective. The "Molnii" [lightning telegrams?] periodically issued in the office have helped this a great deal.

After successfully completing 1957, the collective of the communications office took upon itself new socialist obligations for 1958. The fine totals of work of the first months of the new year give us a basis for believing that the obligations taken on will be fulfilled.

The communications workers of Elektrostal' carried on a great deal of work in serving the elections to the Supreme Soviet of the

USSR. The collective of the communications office also participated actively in agitational mass work among the voters.

Many of the foremost people in the collective of the office, modest workers, regard the task entrusted to them with love. A great deal of work is accomplished by the female mail carriers. They not only deliver to the addressees postal dispatches, printed matter, pensions at the set control periods, but also register payments by mail and give other communications services. Brigadier of mail carriers A. A. Surkova has been working in the collective for more than 20 years. She is well acquainted with all the delivery routes of the city (there are 26 of them) and if necessary can replace any mail carrier. She has prepared many young mail carriers for outstanding fulfillment of their duties. M. Ye. Parfenova, P. T. Khibovskaya, and others have maintained the title of best mail carriers for more than a year. There are also some among the mail carriers who are combining their work with teaching. V. F. Sautkina and M. S. Os'kina are employed in the ninth class of a school of young workers; R. M. Buslavayeva is teaching a correspondence course in communications technology. They are doing good work: the inhabitants of the city have reacted with gratitude to them. Among the telegram deliverers, the example is set by V. P. Shumilkina. In spite of the fact that in her section a great many telegrams must be delivered, she handles them far more rapidly than was envisaged by the control periods. For a period of many months she has not delayed in the delivery of one tele-

gram.

The collective values older communications workers and transfers them to more responsible work. M. M. Demina, T. C. Zimenkova, A. I. Sadovova, and others, were previously mail carriers, deliverers of telegrams. Now they are successfully fulfilling the tasks of assistants to the chiefs of communications divisions and postal agents.

Interurban trunk call office of the communications office.

One of the best communications workers of the office is expediter of the sorting and delivery division L. I. Pogodina. Several years ago she was a mail carrier, then a postal agent. In 45 to 60 minutes she sorts more than 17,000 newspapers according to the urban communications divisions and 10 delivery sections, which are served by the mail carriers of the communications office itself. In addition, during the day Comrade Pogodina sorts journals. She permits no carelessness in her work. Controller of transfer operations M. I. Karakova has well mastered the new postal rules, which she studied

together with the other communications workers of the office. Not without reason have there been any cases of carelessness in her work either.

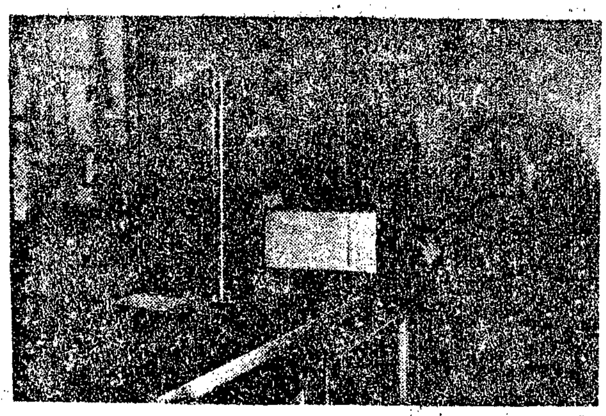
Best expediter of the office L. I. Pogodina sorts newspapers for delivery to the subscribers.

Girls who had completed secondary school started to work at the communications office last year. The collective gave the young workers a fine reception, and surrounded them with attention. The aid of the comrades helped them to rapidly master the communications specialties. One of them, N. F. Khar'kova, completed her specialized courses and is working now as assistant chief of the second city communications division (third class). She is coping quite well with her duties. Another graduate of secondary school, T. V. Smirnova, was first studying to be a postal agent; soon after taking the corresponding examinations she mastered the classification of postal agent of the

first order. When necessary Comrade Smirnova substitutes for workers of the insurance division. She is continuing her study of postal operations and is preparing for the accomplishment of more responsible work.

We can name still more notable workers in the collective of communications workers of Elektrostal'. They are all striving for the same thing -- to give better service to the population. This, for example, is the aim of A. I. Lbova, technician on duty at the radio junction, trade union organizer, who is always anxious about the task entrusted to her and has done impeccable work in this specialization for a quarter of a century. Telegraph worker A. M. Semerikova is fulfilling outstandingly all the industrial operations and is using a method of visual autocontrol in the transmission of telegrams without permitting any carelessness in her work. Telephone operators V. S. Davydova, G. I. Yegorova have for 15 months maintained the title of best in the profession. Newsstand workers O. S. Lifanova, M. Z. Kalandrashvili, M. P. Serikova, M. K. Kolesnikova are fulfilling and surpassing the work quotas, have organized the retail sale of printed matter and are culturally serving their clients. Their photographs are on the board of honor.

Some communications workers, while leaders in industry, are at the same time leading an active social life in the collective. Among them are telegraphic cashier and member of the KPSS, Ye. M. Osipova, who is the editor of the wall newspaper, member of the workers group



Here a client is being helped to pack a parcel in accord with the postal regulations, to wrap it, to write the address, and to fill out the blank.

M. I. Karakova, and others.

All the divisions in the communications office of the city of Elektrostal' are led by women: O. M. Solomatina -- chief of the insurance division, Ye. P. Kudryavtseva -- chief of the delivery division (she is the chairman of the workers committee of the office), Ye. I. Belyeva -- chief of the union printing house division, N. M. Kostina -- senior telegraphist, M. V. Vikhreva -- senior worker at the telephone station. The chiefs of three city communications divisions are also women: A. I. Milkova, M. T. Sukhareva, and M. P. Monakhova. They are all successfully coping with their obligations.

For more than seven years Anna Petrovna Shvedova has been working as deputy chief of the communications office of the city of Elektrostal'. Her working experience in the communications organs

Chief of the delivery division Ye. P. Kudryavtseva directs a meeting with mail carriers.

comprises about 20 years. In this time she has occupied various positions and has achieved a fine mastery of postal communications. She **was able to combine** fine industrial work with social work, serving as secretary of the party organization of the office. In addition to the direction of the office, Comrade Shvedova devotes a great deal of attention to increasing the qualifications of the workers.

The collective of communications workers of Elektrostal' is headed by Nina Semenovna Bol'shakova. After completing the communications technical school in 1935, she occupied the position of radio technician at a radio transmission center, senior technician of an amplification point, and after studies at the year courses for chiefs of rayon communications offices was named chief of the Kalinin communications office of Moskovskya oblast. She directed this office for

Deputy chief of the communications office A. P. Shvedova

seven years and achieved great success in this time. The Kalinin communications workers completed rural radiofication in 1957 as the first in the oblast, and even a year earlier they completed installation of telephone facilities in the rayon. After liquidation of the Kalininskiy rayon, Comrade Bol'shakova was named as chief of a larger communications office -- in the city of Elektrostal'. Comrade Bol'shakova has been working in the Elektrostal' communications office for only a few months. But here also she has succeeded in recommending herself by her skillful work and energetic leadership. Coming into a new collective, Nina Semenovna has become acquainted with the specific conditions of work in a city communications office. She has taken note of the shortcomings existing here and is energetically setting about to removing them.

In the city of Elektrostal' there are more than 10,000 radio receivers and more than 10,000 televisions. Most of the television

Chief of the communications office N. S. Bol'shakova

owners have set up outdoor antennas on the roofs of their homes, attaching the leads of the antenna to the bays of the radiofication lines. As a result of this breaking of the line cables occurs rather often, which disturbs the normal work of the radio points. The directors of the office have placed before the city council of workers'deputies the problem of regulating the installation of outdoor television antennas. Now according to the resolution of the city council new antennas are installed in accord with technical regulations.

With great persistence the directors of the office have succeeded in resolving still another urgent problem for the city of Elektrostal'. Taking into consideration the growing needs of the population of the city for telephone communications, it has been resolved to construct here an automatic telephone station with a 2000-number capacity. This problem was considered in the city committee of the KPSS at a conference in which directors of all the establishments sit-

uated in the territory of the city participated. The facilities of the ATS (automatic telephone station) will be installed chiefly at the expense of interested organizations.

The improvement of the activities of the communications office and divisions is favored by the help given to the communications workers by the Elektrostal' city party and Soviet organizations. The city council of workers deputations has provided good rooms for the city communications divisions, and has also taken care of the everyday needs of the mail carriers, setting aside for them a better hostel, with conveniences, in a new house.

In the hostel of the communications office workers

The collective of communications workers of the city of Elektrostal' does not intend to rest on its laurels. There are still shortcomings in its work. A number of problems are not resolved. Much remains for the collective to do in order to transform its commu-

nications office into a model communications establishment. There is no doubt that the communications workers of Elektrostal' will lend all their efforts to successfully coping with this important task.

S. G. Volkov, L. Ya. Yakovlev

photographs by M. Stepanenko

INDUSTRIAL-TECHNICAL COUNCIL OF THE MOSCOW CITY RADIO BROADCASTING NETWORK

Since the second half of 1955 the industrial-technical council has been working in the Moscow city radio broadcasting network (MGRS). At the council, plans of operational technical measures, drawn up by the management and establishments of the MGRS, the results of the activity of combined brigades of radio workers, and materials on the exchange of progressive experiences are considered. Among the problems which were the subject of consideration at the council, were the plan of subjects of the work of the industrial laboratory and the preparation of the radio service media for the sixth Worldwide Youth and Student Festival in Moscow.

In addition, the general scheme of junction planning of station facilities and main lines and problems of the reconstruction of line economy and the rational utilization of power in the system of station economy of the MGRS were considered in detail and drafts of the work quotas were considered. The individual sessions of the council were devoted to the organization of multiprogram wire broadcasting in the MGRS.

As a rule, workers directly interested in the problems under consideration and the most active member of the engineers and technicians of the MGRS are heard at the sessions of the industrial-technical council. Thus, at one of the last sessions of the

industrial-technical council of the MGRS, where the report of the chief of the industrial planning division of the board of directors L. G. Lokshin, "the technical and economic effectiveness of the introduction of new operating techniques and organization into the MGRS," was heard, more than 60 persons were present.

Industrial-technical councils have also been established in all the undertakings of the MGRS.

A. A. Babenko, Secretary of the
Industrial-Technical Council of
the MGRS

MECHANIZATION OF INDUSTRIAL PROCESSES AT POSTAL ESTABLISHMENTS OF THE UKRAINE

In recent years the communications organs of the Ukrainian SSR have been conducting significant work on the mechanization of operational processes at postal establishments. As a result of this, last year, in comparison with 1951, the number of transporters has increased by nine times, the number of freight elevators has increased 2.4 times, the number of power trucks 1.7 times, stamping machines 6.9 times, postal carts 2.4 times, etc.

In 1956, 46 transporters and three elevators were installed at 24 enterprises, while two power cars, seven tractor trailers, 269 different baggage carts, three stamping machines, 10 package-tying machines, and seven calculating machines were put into service. In 1957, 75 transporters, eight elevators, eight stamping machines, five package-tying machines, two setups for preliminary processing of correspondence, and 12 power cars and trailers were put into operation.

We should state that much of the mechanization of operational processes and easing of the working conditions of the workers in the oblast is done on the spot -- according to the initiative of the management and communications enterprises.

A laboratory of postal techniques was organized at the Kiev post office with the active support of the ministry of communications of the republic, and is busy with the development and preparation of

experimental machines for sorting letters, automatic machines for the sale of newspapers, and automatic machines for the sale of four types of postal blanks.

The workers of the laboratory of postal techniques, traveling to their assignments aid it in the construction of mechanization projects and in revealing needs in mechanisms, and also check the technical condition of various devices.

Mechanization engineers or technicians have been selected for the purpose of imposing qualified supervision on the mechanization of industrial processes of postal communications in Stalin, Lugansk, Cherkassy, Vinnitsa, and certain other communications managements. In the managements where there are no specially selected technicians or engineers, the technical supervision of mechanization is in the hands of the engineers of the postal divisions of the oblast communications managements. In November of last year the Ministry of Communications UkrSSR organized in Kiev a triweekly course for them on problems of mechanization at postal establishments. The students of the course were acquainted with the operating principles, elements of construction, operational-technical characteristics of various mechanized devices, the rules of operating and repairing them, and also with the technical safety measures in operating the mechanisms.

The introduction into communications establishments of devices for postal mechanization has considerable industrial and economic effect and improves the working conditions of the communications work-

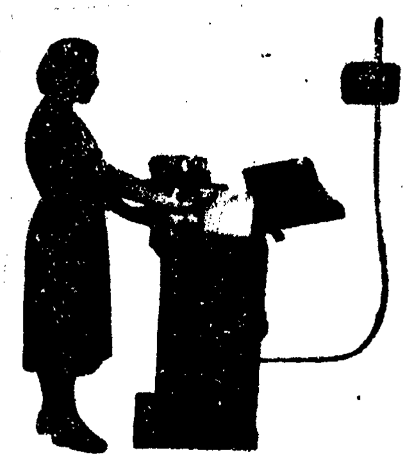
ers.

Examples are the Voroshilov communications office of the Lugansk communications management and the Simferopol' postal-telephone office of the Crimean communications management, and a number of other communications establishments.

The Voroshilov communications office conducts a postal exchange with eight trains and with establishments situated at three intrarayon highways. The average daily parcel exchange in the office comprises up to 1,000 parcels.

Two reversible conveyor belts have been installed at the office. The conveyor belts are mounted in such a way that the load of packages is transferred from the truck to the first conveyor belt and from it mechanically onto the second, which connects the insurance division with the working area for reception of the parcels in the work room. Until these conveyor belts were installed, loading and unloading of the mail was done manually. As a result of the utilization of conveyor belts, two workers instead of five are now employed for this work.

Since 1957 a stamping machine has been used in the Voroshilov communications office. The daily exchange of written correspondence in the office is equal on the average to 25,240 pieces, and of them stamping is applied to 8,700. Until the introduction of the stamping machine into operation, six hours were spent by one worker in stamping correspondence; now the worker spends only two hours on this



A stamping machine is effectively utilized in the Voroshilov communications office.

operation.

In the Simferopol' postal-telephone office there are two 100 kg freight elevators, one of which is designed for the transfer of correspondence from theinsurance division (first floor) to the sorting division (second floor), and the reverse, while the second elevator delivers printed matter from the truck to the delivery division, located in another wing of the office building.

For transportation of postal loads from the trucks to the insurance division and the reverse, as well as for transportation of processed parcels to the loading room and of incoming parcels to the office, two conveyor belts were installed in a right angle; in the newspaper expedition area a conveyor belt was also set up to transfer

In the Simferopol' postal-telephone office, an elevator delivers sacks of newspapers and magazines to the dispatch office.

bundles of newspapers to the trucks; there is a conveyor belt at the exchange point of the railway station, for transportation of the mail from the exchange point to the truck and the reverse.

In addition to this, the Simferopol' postal-telephone office has available stamping and package-tying machines.

The use in the communications office of the indicated devices of postal mechanization has made it possible to speed up transportation and processing of the mail at the internal stages, to improve the quality of processing of the mail, and also to free a considerable amount of man-power. Thus, as a result of the establishment

In the Simferopol' OPP, loading of parcels onto the truck is performed with the aid of a moving conveyor belt.

of an elevator between the insurance division and the sorting division, the necessity for transferring by hand sacks from floor to floor has been removed, which has permitted the freeing of two auxiliary workers of the insurance division, with a yearly fund of payment of 8658 rubles. As a result of the utilization of conveyor belts in newspaper expedition, one person has been freed, and since the establishment of a moving conveyor belt at the exchange point at the railroad station for loading and unloading of the mail, one auxiliary worker is required, and not three, as was the case for manual loading.

In spite of the work which has been done, the postal communications establishments still do not have enough mechanizing devices. In

addition, at the establishments there are frequent cases of the mechanizing devices standing idle, since constructive technical control over the exploitation of the existing mechanisms is lacking. The postal divisions of the oblast communications establishments, whose duty it is to secure the technically correct and effective utilization of all mechanisms, are at fault in this.

It is essential that the introduction of mechanization devices for heavy and difficult work at postal establishments be one of the most important problems of their directors and social organizations.

A. S. Belorusets, engineer of the laboratory of postal lechniques of the Ministry of Communications UkrSSR

PROPER ORGANIZATION OF WORK -- THE MOST IMPORTANT CONDITION FOR THE FULFILLMENT OF THE PLAN OF RURAL RADIOFICATION AND TELEPHONE INSTALLATION

How should the collective of our DRTS organize its work in order to achieve fulfillment of the plan of radiofication and telephone installation and improvement of the service to the public?

We shall begin the selection of objectives of radiofication next year and the signing of contracts in the fourth quarter of this year and shall finish in January to February of thenew year. This period is important for the planning of expenditures for radiofication in the income-expenditure estimates of the kolkhoz, as well as for timely compilation of the documentation for the projected estimates, preparation of materials, etc. In our oblast, contracts with the kolkhoz are signed by the rayon communications offices. At the beginning of the year the SMUR signs subcontracts with all the rayon communications offices and thus determines the volume of work for the entire year. The rayon offices, which are general contractors, are interested in the fulfillment of the plan of radiofication, control more effectively the SMUR work performed. In addition, it is easier for them than for the SMUR to resolve problems of financing with the kolkhoz.

The allotment of credits is of great significance. In the fourth quarter of the year the rayon offices, in their compilation of

preliminary plans of work for the new year, compute their cost and according to the data of the authorized persons of the agricultural bank, determine the credits needed by the kolkhoz for radiofication. All the rayon executive committees direct to the oblast executive committee and the agricultural bank requests for the allotment of these credits.

We conduct the establishment of radio points at the kolkhoz radio junctions and at the radio junctions of the ministry of communications. In both cases the brigades of the SMUR try to encompass the maximum number of households, especially when an underground cable is laid. On the average, in the construction of lines, it is possible to establish up to 20 to 22 radio points per one km. of the subscriber line or up to 13 to 14 radio points per one km. of line, taking into consideration the feeder lines, which have a somewhat lower density than that planned by the ministry of communications. For such a density, the capital expenditures for one radio point increase, and greater expenditures of materials are required for the fulfillment of the plan.

Difficulties with financing and materials force us to seek economic solutions to the problems of radiofication.

In particular, the construction of kolkhoz radio junctions has been discontinued. We are attempting to reduce their number: in 1957 10 kolkhoz radio junctions were closed. We are now constructing new radio station lines from the vital junctions, primarily from junc-

tions of the ministry of communications.

We are widely using suspension of radiofication lines on the supports of intrarayon communications lines. Thus, by 1 January 1957, 294 km. of radiofication circuits had been suspended on the supports of the VRS (intrarayon communications), while during the past year another 182 km. of circuits were suspended. Moreover, line constructions of the VRS in these portions are reconstructed when necessary. Thus, for example, in Novo-Sel'skiy rayon we have made major repairs on 9.5 km. of lines of the VRS, suspended a feeder, and connected to it 380 radio points, while in Veliko-Dederkal'skiy rayon -- correspondingly 7 km. of lines of the VRS and 180 radio points.

For the first time the technical rules of joint suspension were not observed, and this has proved detrimental to the working of the VRS. This defect was removed at once; the rayon offices gained experience in the operation of VRS lines with radiofication networks suspended on their supports, and they themselves are now the initiators of joint suspension.

On the underground subscriber lines we use PTVZh and TRVK wire for small branches (length up to 100 m.) with a load of three to four radio points. In 1957 we laid 680 km. of PRVPM cable and 80 km of TRVK and PTVZh wire.

The kolkhoz transportation is widely used in work on radiofication. The kolkhoz frequently allocate their working force for digging

trenches.

What the economic effect of these measures has been is evident from the following figures. According to the plan, the capital investment for one radio point should comprise in our oblast 110 rubles, while for 10 months of 1957 for the work of our SMUR the capital expenditure for one radio point came to 107 rubles 30 kopecks, while when the sums refunded to the kolkhoz are deducted, the capital expenditure was 96 rubles 80 kopecks.

For maximal utilization of the local possibilities and for economic expenditure of materials, we are attempting to suspend radiofication wire on the supports of electric lines. Proceeding from this, at the beginning of last year the DRTS refined the objectives of its work for 1957 in Sel'elektro (rural electrification). We used 145 km of electric lines last year. Indeed, it is true that frequently the reverse phenomenon occurs: electrification occurs after radiofication or simultaneously with it. Thus, for example, the kolkhoz workers of the village of Godov, Zborovskiy rayon, acquired a generator and after construction of radiofication required the construction of high poles on the radio relay line and a decrease in the gaps between them to 35 to 40 m. We proceeded on this, for which it had been preliminarily agreed with thekolkhoz to allot to us additional poles and devices for lifting the supports. As a result, 200 radio points were established in this village.

The DRTS attaches great importance to finding materials for

radiofication on the spot. In those rayons where the superintendents of the communications offices are seriously concerned with these problems, it is successfully resolved. Thus, for example, in Shumskiy rayon, the rayon communications office was able to ship wood from Stanislavskaya oblast to the kolkhoz and obtained 50 cubic meters from it for radiofication, which made it possible to finish the completion of the yearly plan of development in this rayon in the first half of September. Similar things occurred in Kremenetskiy, Lanovetskiy, and other rayons of the oblast. Frequently radiofication workers turn to the oblast executive committee for cooperation in acquiring poles.

A very great help was the preparation of reinforced concrete attachments at the proving ground organized by the SMUR. In six months about 4000 attachments and more than 300 reinforced concrete supports were manufactured at this proving ground.

The funds allotted by the central agency for line materials (poles, cables, etc.), even when all of them were shipped, will permit the fulfillment of no more than 70 to 75 percent of the quota of establishment of radio points. We shall fulfill the remaining 25 to 30 percent of the quota through the construction of radio points on existing lines. District technicians and mechanics of the DRTS, foremen of the SMUR, and supervisory workers of the DRTS go out into the rayons and check the degree to which the radio points encompass the previously radiofied villages and seek, jointly with the rayon

communications offices and kolkhoz, possibilities for introducing radio into all the homes in these villages. In many cases a small amount of supplementary work (the construction of 10 to 15 radio points on existing lines of the village) has a good effect in the final result. Thus, in the first half of 1957, new lines were not constructed in Berezhanskiy, Borshchevskiy, Vishnevetskiy, Grimaylovskiy, Chortkovskiy, Kremenetskiy, and Probezhnyanskiy rayons on account of the lack of poles. However, in these rayons 1850 radio points were constructed on the existing lines; moreover, in Borshchevskiy and Chortkovskiy rayons the yearly quotas were even exceeded. During the past year about 6.5 thousand radio points were established on existing lines in the oblast.

The kolkhoz radio workers can also participate activly in the radiofication.

During the past year the DRTS, jointly with the oblast committee of the young communist league, organized a competition of rayon and kolkhoz young communist league organizations, as well as of radio junctions of the ministry of communications and kolkhoz, for fulfillment of the radiofication quota ahead of time, for raising the quality of work of the radio junctions, and also for improving the operation of radiofication networks and the VRS. The competition was supported by the oblast committee and the rayon committees of the KP of the Ukraine. This played a positive role. In Zalozhtsevskiy rayon, which had previously lagged in radiofication, the secretary of the

rayon committee of the young communist league, Comrade Kamenetskiy, organized a collection of applications for radiofication in two villages, and here the communications workers with the aid of the kolkhoz young communist league organization radiofied 200 houses. In Monastyrisskiy rayon the secretary of the rayon committee of the young league, Comrade Lysak, collected 25 applications in one village for the establishment of radio points. All these radio points were equipped.

With the cooperation of the young communist league, radio worker of the kolkhoz radio junction of the village of Tovstobab, Monastyrisskiy rayon, Comrade Gevak, radiofied 140 homes from existing lines. The kolkhoz radio workers of Gusyatinskiy, Koropetskiy, Borshchevskiy, and other rayons of the oblast equipped hundreds of radio points.

We are paying a great deal of attention to the improvement of the operation of radio junctions and the elimination of wasted time. In 1957 alone we established at the junctions 26 reserve sources of power supply and 40 reserve radio receivers, repaired the station apparatus of 16 kolkhoz radio junctions, and organized a regular aid to the kolkhoz radio junctions on the part of district technical mechanics and a mobile shop. This permitted a decrease in the wasted time at kolkhoz junctions in 1957 from 4.4 percent (the level of 1956) to 1.4 percent. The time waste at junctions of the ministry of communications was also decreased, from 0.15 percent in 1956 to 0.04 per-

cent in 1957.

The DRTS and the rayon offices have performed significant work in putting in order the high-voltage feeders, coil loading of underground lines, and the establishment of feeders, impedence-matching transformers, and other devices for obtaining good sound at distant, newly established radio points. As a result of this, the amount of damages to radio networks was cut in 1957 to 20 percent in comparison to 1956, and the number of complaints of poor audibility was cut to one third.

The directors of the DRTS maintain constant control over the course of work on each rayon and object and, if necessary, give aid with materials or man-power. The DRTS conducts conferences by wire, calls the chiefs of distant rayon communications offices to the oblast communications managements for an accounting, and encourages the leading communications offices and individual communications workers. The DRTS informs the rayon committees of the KPU on progress toward fulfillment of the quota. Workers of the DRTS go out into the distant rayons and can seek on-the-spot possibilities for accelerating the radiofication.

The directors of the SMUR systematically control the work of the brigades and work parties in fulfilling theplan of establishment of radio points. The district technical mechanics, before whom the task of ensuring fulfillment of the plan of the growth of radio points in the rayons reinforced by them is set, give aid to the communica-

tions offices, the kolkhoz radio junctions, and the brigades of the SMUR. All this permits the fulfillment of the quota of growth of radio points in almost all the rayons of the oblast, in spite of material, financial, and other difficulties.

Thus, the plan of the first half of 1957 was realized ahead of time in the oblast -- on 20 May; on the fortieth anniversary of the Great October Socialist Revolution the yearly plan was completed in 16 rayons, while on the whole in the oblast the plan was fulfilled by 106 percent, in spite of the absence of poles and unfavorable meteorological conditions. The collectives of the Zborovskiy rayon communications office (chief, comrade Koshevaya), where after 11 months the yearly plan was realized by 127 percent, the Gusyatinskiy rayon communications office (chief, comrade Geletskiy) -- by 115.5 percent, and Terebovlyanskiy rayon communications office (chief, comrade Slobodyan) -- by 115 percent, proved to be in the first ranks of those completing the fulfillment of the radiofication quota ahead of time.

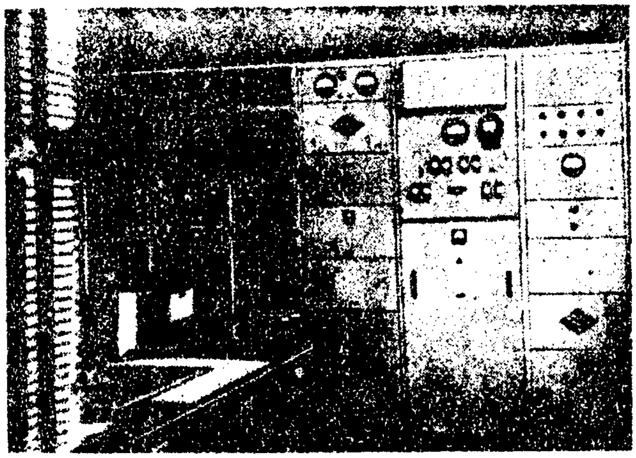
A few words on telephonization. Telephones have been installed in the village soviets in our oblast. The principal attention is paid to telephone installation in kolkhoz owing to , both the means of the local budget and the attracted means and materials of the customers.

The further development of the VRS network and the improvement of the quality of communications work is promoted by the measures put into effect by the DRTS for putting the line equipment in good condi-

tion, introducing UPTS facilities and the VChR apparatus, installing station equipment, and repairing switchboards and telephone apparatuses. Thus UPTS facilities have been installed at 37 telephone substations of the 121, and ATS VRS equipment has been installed at six, as a result of which (taking into consideration the large number of VRS substations which are manually operated) about 40 percent of the VRS subscribers are provided with round-the-clock communications. By means of introduction of VChR apparatus, it has been possible to eliminate the multistage nature of VRS communications and to increase the carrying capacity of the connected networks.

A check made by the oblast interurban telephone station showed that 88 percent of the village councils have an outlet to the interurban telephone network with the guarantee of good and clear audibility. The improvement in the quality of work of the VRS substations, as well as the utilization of the radiofication line supports for suspension of VRS networks, permits the fulfillment of the plan of growth of subscriptions to the intrarayon communications with minimal expenditures of materials.

The plan of telephone installation envisaged in 1957 has been completely fulfilled. At the end of the year telephones had been installed at 80 percent of the kolkhoz. The collective of radio workers of Ternopol'skaya oblast achieved the completion of continuous radiofication of the rural locality and telephone installation in all the kolkhoz ahead of time.



In the Kremenets communications office the service of electrocommunications media and the equipment of a radio junction are combined.

Kolkhoz radio worker of the village of Tovstobab, Monastyrsskiy rayon, V. S. Gevak, checks a radio line.

M. Ye. Tul'chinskiy, chief of the Ternopol' DRTS

EXCHANGE OF EXPERIENCES IN MECHANIZATION AND AUTOMATION

In the city of Gor'kiy a conference of workers in the communications field was convened, in which deputy chiefs of communications offices, workers of line-technical junctions, section technicians, and the chiefs of divisions of radiofication of the rayon communications offices took part. At this conference, problems of the application of the devices of mechanization in the construction of radiofication line installations and intrarayon communications, and also the introduction of automation in the VRS networks, were examined. The experimental exchange took place not only in the conference rooms but also at the proving ground, where a drill, a cart pole-setter, and crane drilling equipment were demonstrated in action, and also in the technical office, where the semiautomatic telephone communications installation (UPTS) was shown.

Superintendent of the Gor'kiy LTU, V. D. Golovanov, told about his work experiences. He was the first in our oblast to begin using a light-duty winch for installing supports, following the example of the superintendents of the Far East, and obtained good results. Comrade Golovanov showed the work methods with a light-duty winch in a number of rayons of the oblast. At the end of last year 70 winches were already being used in our oblast. In Lyskovskiy rayon alone, more than 200 supports were replaced with the aid of a winch.

At the conference a serious shortcoming of the winch outfits supplied by the factories was noted: there is no attachment for fastening the winch to the pole. This is all the stranger, since in the journal "Vestnik Svyazi" [Herald of Communications], (No. 2, 1957) an extremely simple attachment of this type was described.

In the economy of our oblast more than 150 drills for digging pits under the supports are in operation (the construction of the drill was described in the journal "Vestnik Svyazi" [Herald of Communications], (No. 11, 1956). With the aid of these mechanisms, for example, in Vachskiy rayon, 1300 pits were dug, while in Urenskiy -- 600, Krasno-Bakovskiy -- 550, etc. The general opinion of the drill was expressed by deputy chief of the Krasno-Bakov communications office A. N. Gorbunov, who said: "We like this valuable device -- the drill -- very much."

The speakers told how they prepare holes under the supports and set up the latter in them, how they prepare holes under the attachments, etc. It was proposed that the drills be supplied with auxiliary blades. An experienced communications worker, deputy chief of the Vetluzh communications office, A. I. Rozhin, reported on how he organized work setting up supports in swamp areas. Using two alternately working drills, he succeeded in keeping the holes from "filling up." This experience is extremely useful, since there are many swamp areas in Gor'kovskaya oblast, as well as elsewhere.

The inventor of the drill, Gor'kiite V. B. Inshakov, answered

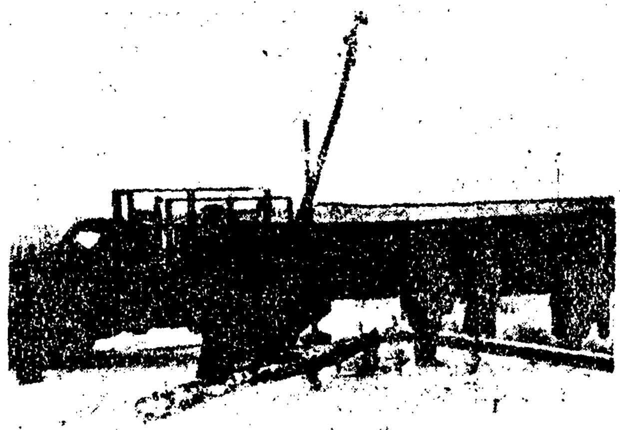
the proposal for improving and changing the construction of the drill. It is recognized that the dimensions of the drill he selected are successful. The change in the dimensions and construction (movable handle, sectional beam) would produce a barely warranted increase in its complexity and cost.

All the participants in the conference expressed a desire to have more drills and of better quality. The technology of their manufacture requires high technical efficiency; hence an adjustment of the output of drills by industrial establishments is necessary.

Chief mechanic of the Gor'kiy SMUR, A. N. Savel'yev, told of the pole-setter cart which he developed and then demonstrated the action of this device. When a winch is available, such a cart can be assembled in any machine tractor station, and it considerably lightens the work of setting up supports in cylindrical holes dug by the drill. It can have wide general application.

Great interest was evoked among the participants of the conference by the crane drilling setup on a type GAZ-63 truck. A similar device was constructed at one time in the Stalingrad radio broadcasting network management. Comrade Savel'yev introduced his own original ideas into it. Thus, for example, the motor hole driller is fastened to the chassis not rigidly but on hinges. Hence it is rapidly, readily, and simply transferred from the vertical position to the horizontal position. This provides great convenience in transportation. The winch is set up in front of the radiator of the truck and is operated

by the driver from the cabin. It can thus be used not only for setting up supports but also as an "automatic hauling" machine during towing."



Crane drilling setup, manufactured by the workers of Gor'kiy SMUR

In the process of further exploitation of the cart pole-setter and the crane drilling setup, a number of improvements will be introduced into the construction of these devices.

In Gor'kovskaya oblast the number of supports set up on communications lines runs into the hundreds of thousands. In connection with this, the report of engineer A. P. Dobrotvorskiy on prolonging the period of service of supports by means of timely and high-quality treatment of them and by the setting up of reinforced concrete supports and attachments was considered separately at the conference.

An interesting experience was related by chief of the Krasno-Bakov LTU, V. I. Solntsev. For several years now impregnated

supports have been employed at this junction, which promotes a decrease in the number of supports needed for replacement.

In one year the number of automatic and semiautomatic telephone stations in the oblast increased fourfold. At present 15 ATS VRS and 17 UPTS are in operation here. All this permitted a shift to round-the-clock work for a considerable number of the telephone substations. In addition, the possibility was afforded of freeing a number of workers for utilization in other divisions. The continuous control check of the work of constructing semiautomatic communications, performed by the management of the radio broadcasting network, showed that in certain rayons normal operation of the UPTS was not being maintained. It was decided to consider this problem at the conference. The participants of the conference considered beforehand the sample tables drawn up by V. I. Semenov and Yu. V. Gortinskiy, in which the basic defects possible in the UPTS and methods of detecting and removing them were presented. Literature references on problems of automation of intrarayon communications were cited.

In a UPTS assembled in the technical office, the interrelationships of the individual elements of this device and the defects arising in them were demonstrated. All this enlivened the exchange of opinions. Thus, for example, deputy chief of the Sechenov communications office V. N. Nikitin, told about several interesting improvements which he introduced into the UPTS.

Radio worker comrades Semenov, Gortinskiy, Kolotilov, Maksimov, and Kochetov helped the radio broadcasting network management to carry out in a relatively short time the assembly of a large number of UPTS and ATS VRS setups. They introduced a number of proposals published in a separate brochure and in the cards of the TYekhSO. All these proposals are currently being successfully utilized. An interesting new work performed by comrades Lizunov, Maksimov, and Gortinskiy is the use of a rectifier for feed of the UPTS with automatic transition to the galvanic elements.

This year we intend to send a small brigade to the Leningradskaya oblast for the study of an experiment in automation of the VRS. We also plan to hold a seminar in Bogorodskiy rayon (four ATS VRS have been established there) for workers in those rayons in which such stations have already been established or will be established in 1958.

At the conference the problem of exploitation of the line establishment of the VRS and of radiofication was considered. It was resolved to attract line-technical junctions to this work.

The conference also considered problems of radio operation and safety techniques.

While noting the achievements of the work done in the past years, the participants of the conference emphasized at the same time that the rayon communications offices and line-technical junctions still possess few means of mechanization and automatic devices, and

that there are defects in the equipment itself and in the system of its operation. The LTU and the communications offices do not completely guarantee the electric drills and combined instruments. Means of automation of rural radiofication networks are being introduced very slowly. This is the fault of a number of industrial concerns who do not fill their orders. In addition there is a poor supply of technical information.

The most rapid possible removal of all these and many other shortcomings will promote the improvement of work of the communications media and rural radiofication.

N. S. Fayngersh, Chief Engineer of the Gor'kiy DRTS

COMMUNICATIONS BUILDING IN NOVOROSSIYSK

NEW COMMUNICATIONS FACILITIES

On one of the streets in the center of Novorossiysk stands a beautiful new building — the Communications Building. Its dimensions are described by such figures as: total structural volume of the building, 16,652 cubic meters; area of the working premises, 3,325 square meters. The operations roomsand recreation room, as well as a number of work rooms, were designed in the finest taste.

In the Communications Building are located the city communications office with operations room, as well as all the divisions of

postal communications -- money order, sorting, and others. The telegraph, interurban and automatic telephone stations, and a radio junction will soon be located here.

The industrial offices are equipped with devices of mechanization. Thus, a type ShM-51c stamping machine with capacity of 10,000 letters an hour, a dust-removing unit, and three conveyor belts are already in operation.

The placing of the Communications Building in operation has promoted an increase in the efficiency of service to the public, expedition in the processing and delivery of correspondence, and lightening of the work of the communications workers.

STEPWISE SWITCHING ON OF THE FILAMENT OF HIGH-POWER RADIO TUBES

As is well known, it is most economical and convenient to supply the filaments of high-power radio transmitters and amplifiers by alternating current. Here the circuit for switching on the filament should be such that the current of the tube filament at any moment of the insertion does not exceed 1.5 I_{nom}, where I_{nom} is its nominal value. The resistance of the thread of the filament in the cold state is less than that in the working system: 12 to 14 times less in a tube with a tungsten cathode, nine times less in a tube with a tungsten activated cathode, and seven to nine times less in hot-cathode gas-discharge rectifiers and thyratrons. Hence the supplying of the filament should be carried out by means of special trigger devices.

A method of switching on the filament with the aid of a regulating transformer with movable short-circuited coil has obtained wide application. Such a method of switching on the filament is quite satisfactory. However, it requires the use of expensive equipment whose coefficient of utilization is very low.

Individual high-dispersion filament transformers which need no trigger devices are also used. However, such a transformer has 20 to 30 percent more copper and steel by weight than the normal

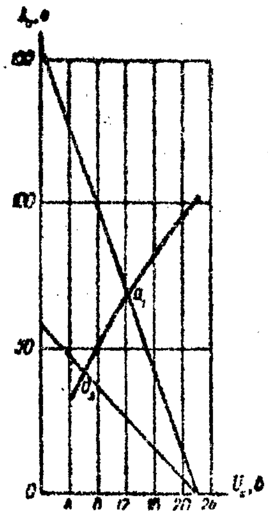
transformer and has a low $\cos \phi = 0.7$ to 0.8; when it is assembled in each individual case it is necessary to regulate the clearance of the magnetic circuit or to match the number of turns.

A simple, sufficiently reliable, and cheap method is the stepwise switching on of the filament voltage. However, this method has not yet found wide distribution. It is generally considered that since the resistance of the thread of the filament varies within broad limits, then in order for the current during switching on not to exceed the permissible quantity, it is necessary to use a multistage switching circuit. But such a circuit is cumbersome and not reliable.

However, calculations indicate that in all cases two-stage switching on is satisfactory: first the circuit of the filament into which the trigger resistance is inserted is connected to a bus of stable voltage, and then after 20 to 30 seconds the trigger resistance is short-circuited. The resistance should be connected into the primary circuit of the transformer.

Let us make the calculation for a concrete case, switching on one tube of the type G-452 with a tungsten cathode; nominal voltage of the filament is $U_{nom} = 22V$, nominal current of the filament $I_{nom} = 102a$. The volt-ampere characteristics of the tube are depicted in the figure.

The voltage of the supply network $U_1 = 220V$. The supply is carried out through the individual 220/22V normal-type transformer of



$^{\gamma} U_{f}, ^{v}$

the filament, without any additional elements (rheostats, reactors) in the circuit in addition to the trigger resistance.

We shall consider that the resistance of the thread of the filament in thecold state is equal to zero, while the loss in the filament transformer comprises 10 percent. Then the minimal value of the trigger resistance at which the shock of the current, when the supply is first switched on, reaches 1.5 I_{nom}, is equal to

$$R_{n\,мин} = \frac{U_1^2}{1{,}5 \cdot 1{,}1 P_{н}} = \frac{U_1^2}{1{,}5 \cdot 1{,}1\ U_{ном}\ I_{ном}} = 13{,}1\ ом.\ ohms$$

After switching on, as the thread of the tube filament begins to warm up, the load increases, the current decreases, and a redistribution of voltages takes place: the voltage on the tube and primary winding of the transformer increases, while the volt-

age on the trigger resistance drops. In practice the currents and voltages reach the established values after approximately 20 to 30 seconds.

Furthermore, let us determine the magnitude of the established values of the current I_f and the voltage U_f of the tube filament when a trigger resistance is inserted, and then the magnitude of the second shock of the current I_{f2} when the trigger resistance is closed. We shall carry out the solution by graphical analytic methods.

The magnitude of the current in the secondary circuit of the transformer when the trigger resistance is inserted can be expressed in the following way:

$$I_2 = \frac{U_{\text{ном}} - U_н}{1{,}1\, R_п n^2} \approx$$

$$\approx \frac{U_{\text{ном}} - U_н}{1{,}1\, R_п \left(\frac{U_{\text{ном}}}{U_1}\right)^2},$$

where n is the coefficient of transformation. This expression is represented in the coordinates of volt-ampere characteristics (see figure) by a straight line intersecting the y axis at a current

$$I_2 = 1{,}5\, I_{\text{ном}} = 153\ а$$

and the x axis at a voltage $U_f = U_{nom} = 22V$.

The point a_1 of intersection of this straight line with the volt-ampere characteristics of the tube gives the established values

of the current I_f = 68a and of the voltage U_f = 12.2V when the trigger resistance is inserted. The maximal value of the second surge of the current when the trigger resistance is closed is

$$I_{2\,max} = \frac{I_f U_{nom}}{U_f} = \frac{68 \cdot 22}{12{,}2} = 123\ a,$$

i.e., 20 percent greater than I_{nom}.

An increase in the trigger resistance leads to a decrease in the first current surge and an increase in the second. Let us determine the maximum value of the trigger resistance at which the second current surge occurs,

$$I'_{2\,max} = 1{,}5\, I_{nom} = 153\ a.$$

In this case the point a_2 of intersection of the characteristic should correspond to the resistance of the thread of the tube filament :

$$R_f = \frac{U'_f}{I'_f} = \frac{U_{nom}}{I_{2\,max}} = \frac{22}{153} = 0{,}143\ ohm.$$

Constructing the graph $R_f = f(U_f)$ on the basis of the volt-ampere characteristics of the tube, we find that R_f = 0.143 ohm corresponds to U'_f = 6V and I_f = 42a. According to these data let us note point a_2 on the graph and draw the straight line; the point of its intersection with the y axis determines the magnitude of the first current surge, equal, in all, to 58a or only 59 percent of the nominal value of the current of the filament.

The maximal value of the trigger resistance is

$$R_{п\,макс} = \frac{U_{ном}^{\,max} - U_{н\,у}'}{1{,}1\, I_н'\, n^2} = \frac{22 - 6}{1{,}1 \cdot 42 \cdot 0{,}1^2} = 34{,}5\ ом \quad \text{ohms}$$

Thus, the magnitude of the trigger resistance is not very critical and can be selected in this case within the limits

$$R_п = (13{,}1 \div 34{,}5)\ ом. \quad \text{ohms}$$

The calculation made was performed for a tube with a tungsten unactivated cathode, the resistance of which varies within wide limits; as can be seen from the calculation, the magnitude of the trigger resistance is not critical; in addition, since the volt-ampere characteristics of various tubes are approximately the same in nature, all this permits us to consider that for tubes of other types as well one supplementary stage of switching is sufficient.

Thus, the trigger device for any number of simultaneously switched-on tubes of various types consists of a set of trigger resistances, their closing contactor, and a time relay. It is expedient to use a thermal relay for the latter.

In practice the magnitude of the trigger resistance can be determined by a simpler method. If the thread of the tube filament is supplied from one phase of the network, then the magnitude of the trigger resistance should be taken within the limits

$$R_п = (0{,}7 \div 1{,}7)\,\frac{U_1^2}{P_н},$$

where U_1 is the voltage of the network, P_f is the power going to the filaments of all the tubes (including losses in the transformers). If the load is distributed equally among the three phases, then it is necessary to insert a trigger resistance into each wire of the line, the magnitude of which is determined by the same formula, except that instead of U_1 the necessary line voltage is substituted. If the load is distributed unevenly among the phases, then the known methods of calculating three-phase networks should be used, or the trigger resistances, calculated the same way as for an evenly loaded system, should be inserted and then their magnitudes corrected experimentally by measuring the magnitudes of the starting currents. These measurements can be conveniently performed with the aid of an oscillograph (especially if the tube possesses a large screen afterglow), using this oscillograph as an inertialess voltmeter. The oscillograph should be connected to each portion of the wiring leads of the secondary circuit of the filament, the voltage drop across which is sufficient large (fraction of a volt). It is convenient to graduate the scale of the oscillograph in fractions of the nominal filament current. If the sensitivity of the oscillograph is not sufficient, then the voltage at its input should be supplied through a small step-up transformer.

The dimensions of the trigger resistances obtained are relatively small. Thus, one carborundum resistance 25 mm in diameter and 300 mm long can be used for simultaneous switching on of two to three

G-452 tubes.

The basic assumptions of the energizing system described have been verified in practice in the reconstruction of the radio broadcasting transmitter of Voronezh radio center.

A. V. Bespamyatnov, engineer, chief of the Voronezh radio center

CUTTING OFF PILOT FREQUENCY CURRENTS IN A V-12 APPARATUS

As is well known, supply can be guaranteed to ten 12-channel systems with the aid of generator equipment of a V-12 terminal station. The generators of pilot frequencies can also supply up to ten 12-channel systems. For example, at terminal stations B, pilot frequencies of 64 and 104 kc are used for all variants of the spectrum.

On the allocation panel of the pilot frequency currents, the possibility was not foreseen of cutting off the pilot frequency currents used for each system individually. However, during measurements when diagrams of the levels are being taken, cutting off of the pilot frequency currents is required: first of the "flat" current, then of the "slant" current, then simultaneously of the current of both frequencies. If the pilot frequency current is not cut off in the generator equipment, then delivery of this current into the line to all the operating 12-channel systems ceases, which, of course, cannot be permitted.

In order to remove the indicated constructional shortcomings of the apparatus V-12, "resonance voltage" circuits for 40, 80, 92, and 143 kc should be supplementarily mounted on an OSVK framework. Computation of each of these circuits can be performed according to the simplified formula

$$f = \frac{1}{2\pi\sqrt{LC}},$$

where L is the induction in henrys, C is the capacitance in faradays.

For convenience in operation the circuits are attached to the free jacks of the framework OSVK. The scheme of attachment is presented in Fig. 1.

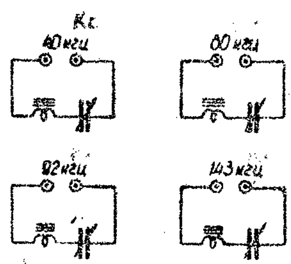


Fig. 1

If stoppage of the feed of the pilot frequency current into the line shared by the apparatus of the 12-channel system is required, it is sufficient to connect the jack into which the circuit for 40, 80, 92, or 143 kc is inserted in parallel with the jack K - 33 of the metered 12-channel system. In this case a short circuiting of the pilot frequency current takes place, and the latter does not enter the given line.

The circuits should possess a high quality factor: this permits damping in the circuit of the pilot frequency current up to four and even five nep. It is also necessary to vary the variable capacitance or variable inductance in the circuits, which makes the realiza-

tion of accurate tuning of them possible.

The tuning of the circuit can be carried out according to the circuit presented in Fig. 2. When varying the inductance it is essential to insure that the resonance circuit introduces damping of no less than four - five nep. In the tuning it is desirable to use the level indicator LI with selecting attachment SA, which permits accurate tuning to the pilot frequency current. If there is no such level indicator, it is possible to perform the tuning with the aid of a broad-band level indicator inserted into the jack K - 33 instead of the line.

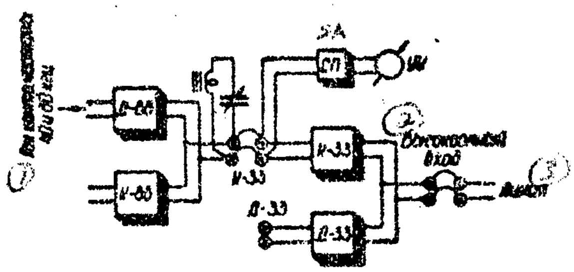


Fig. 2.
1 - pilot frequency control, 40 and 80 kc; 2 - high resistance input; 3 - lines.

V. L. Krivonos, master engineer of the Khabarov interurban telephone station

THE TYPE 14D REPERFORATOR-TRANSMITTER

The firms "Teletupe [sic] Corporation" and "Bell Telephone Laboratories" have jointly developed a type 14D reperforator-transmitter — a device designed for utilization in systems of automated reception of telegrams with coded switching. The type 14D reperforator-transmitter contains a transmitter, a selector, decipheror, and printing mechanism of the tape telegraphic apparatus, a nonshredding reperforator, and a revolving transmitter, with the aid of which reception of telegrams (including the last combination) proceeds without supplementary discharge of perforated tape. The overall size of the device does not exceed the overall size of the unusual tape telegraph apparatus. Transmission from the transmitter proceeds at a rate of 65-75 words per minute, while transmission to the reperforator proceeds at a rate of 65 words per minute.

The construction of the reperforator-transmitter type 14D is schematically shown in Fig. 1; there 1 is the mechanism of transmission and storage of signals, 2 - changeover and accumulator contacts, 3 - holding device, 4 - distributor contacts, 5 - distributing shaft, 6 - receiving and transmitting shaft, 7 - loop of tape, 8 - selector bars of the reperforator, 9 - transmitter head, 10 - perforating unit, 11 - type lever, 12 - anvil, 13 - tape with tape winding openings, 14 - se-

lection bars, 15 - perforating clamp, 16 - unit for perforation of tape winding openings, 17 - perforating cam, 18 - perforating lever, 19 - slide bars, 20 - T-shaped levers, 21 - selector levers.

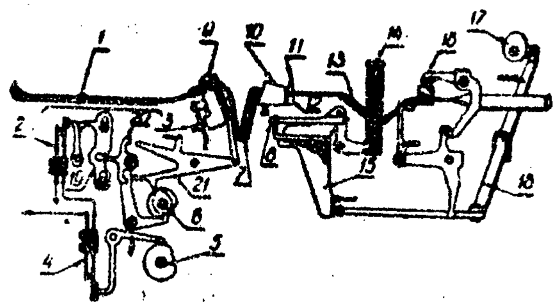


Fig. 1

The transmitting and perforating units work independently of one another, which permits either immediate reception of telegrams or their storage if the outgoing channel is busy.

The transmitter head can be moved along the perforated tape. When the telegram enters the reperforator (the transmitter head is found in the extreme left-hand position), storage of the telegrams in the form of loops of perforated tape takes place. As the telegrams are transmitted the loops of tape decrease, and the transmitter head is moved over to the extreme right-hand position, approaching the site of perforation.

Printing of the text received is accomplished through the action of two cams of the main shaft.* The punches which perforate the

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* The main shaft is not shown in the figures.

openings do not completely cut off the confetti, and the signs are printed directly at the places of perforation.

The tape winding openings are perforated in a special unit situated in front of the basic perforating unit. The distance between the tape winding openings is equal to 0.1 inches.* The necessity for preliminary perforation of the tape winding openings is caused by the fact that the last perforated combination is taken down by the needles of the transmitter at a point 0.1 inches from the site where the perforation takes place.

The movement of the tape in the reperforator by one step at the end of each cycle of operation is affected by the tape winding spider of the perforation unit.

In Fig. 2 the transmitter head is shown in the extreme right-hand position. In this figure: 1 - transmitter head, 2 - perforating unit, 3 - type lever, 4 - moving tape winding lever, 5 - anvil, 6 - tape winding lever with needles.

The winding of the tape in the transmitter is performed by the tape winding lever. The transmitter head performs in such a way that when it moves transmission of the telegram can take place. Uniformity of motion of the head is accomplished by means of careful preparation of the tape winding cam, which displaces the tape winding lever upward

* One inch is equal to 2.54 cm.

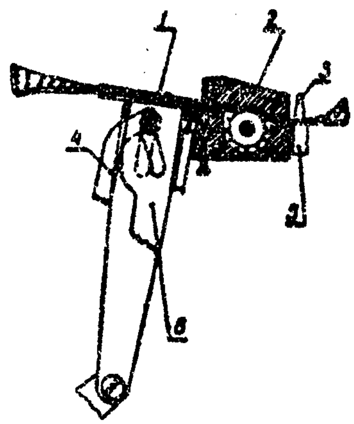


Fig. 2

or downward by means of an intermediate lever. Vertical displacement of the lever in conjunction with horizontal displacement, which is provided by the form slit in the lever, forces the tape winding needles to move in a closed rectangle.

The transmitter operates in the following way. In the starting position the tape winding needles are lifted while the selectors are lowered. At the end of each new cycle the tape winding needles displace the tape to the left by 0.1 inch, so that the portion of the tape with the following perforated combinations is placed against the selector needles. Then the selector needles are lifted, while the tape winding needles are lowered. After the selector needles are lifted, the intermediate levers occupy a position in the gap corresponding to the combination perforated on the tape.

Five sliding bars (19) of a single combination accumulator are displaced under the action of the T-shaped levers (20) which interact with the forks of the selector levers (21) of the transmitter (Fig. 1). Each sliding bar interacts with one contact group. Thus, the combination is fixed in the form of the corresponding position of the contact groups. Transfer to the tape takes place with the aid of a cam distributor and transfer contact groups.

The working cams which direct the tape winding lever, the selector levers, and the clamp of the storage device of the transmitter, are set on one axis. The cam distributor is situated separately. Coupling of the cams with the receiving and transmitting shaft is accomplished with the aid of trigger electromagnets. The electromagnet of the cam of the tape winding lever sets a special contact group in motion (this group is disconnected when the transmitter head occupies the extreme right-hand position).

External circuits control the switching on of the receiving and transmitting shaft.

B. A. Glyantsev, engineer

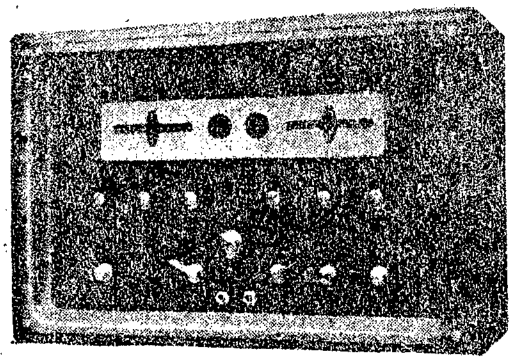
THE "WAYNE KERR" TYPE B.221 UNIVERSAL BRIDGE

The type B.221 universal bridge is an extremely accurate bridge device of improved construction. The construction of the bridge permits variation of the total resistances or transfer conductivity within a very wide range at an operating frequency of 1592 cycles on two-three-and four-line networks. Since the resistance of the measuring wires does not influence the measurement, they can be of any length. As a result of this characteristic, the device is suitable for the determination of the temperature coefficient of components under experimental conditions or for carrying out any (on the spot) long distance measurements.

The specially constructed adapters for measuring conductivity, dielectric constant, and coefficient of loss of solid and liquid bodies are finding ever wider applications in the field of process and quality control. This bridge is one of the examples of the high quality precision instruments of the broad Wayne Kerr series.

Specifications

Bridge only: capacitance: from 0.0002 $\mu\mu$f to 10 μf (seven ranges); precision $\pm$0.25 percent. Conductivity: from zero to $\pm$100 1/kohm (seven ranges). Inductance: from one mh to infinity (seven ranges). Measuring frequency 1,592 cps. Supply: 110/115 and



200/250 V; 40/60 cycles. Dimensions: 432 mmx178 mmx292 mm.

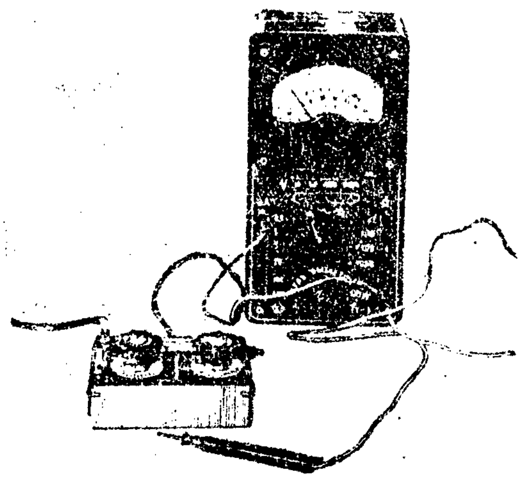
Weight: 11.34 kg.

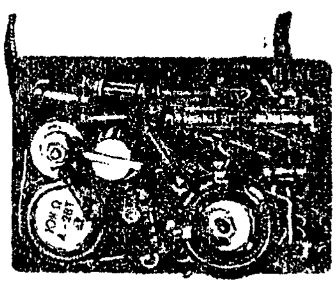
With low total resistance adapter: capacity from one μf to 100,000 μf (four ranges). Resistance from zero to 100 ohms (four ranges). Discrimination at the lowest range 50 μohms. Inductance: from zero to 10 mh (four ranges). Discrimination at the lowest range, five μh.

WAYNE KERR
THE WAYNE KERR LABORATORIES, LTD.
Roebuck Road — Chessington — Surrey, England

FROM OUR CREATIVE INNOVATORS AND INVENTORS

ATTACHMENT TO THE TT-1 APPARATUS FOR MEASUREMENT OF CAPACITANCE AND HIGH RESISTANCES



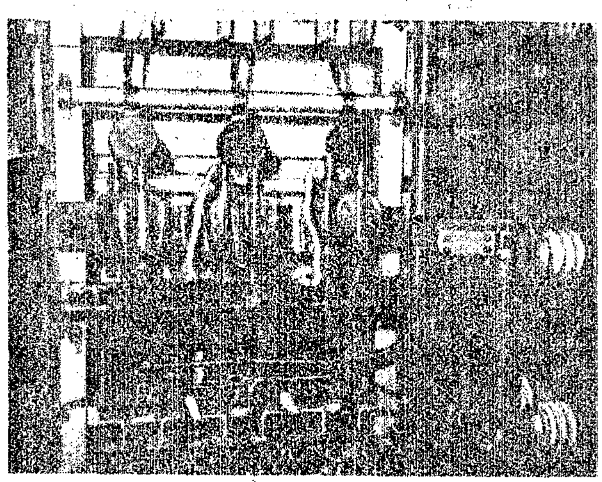


Radio mechanic of television studio number 12 (city of Elektrostal') K. I. Samoylikov has constructed and produced a simple attachment for the TT-1 apparatus, with the aid of which it is possible to measure capacitance of condensers from 1000 $\mu\mu f$ to 160 μf and resistance up to 20 Mohms. The attachment can be connected to the

apparatus only through the external terminals of the TT-1.

The attachment is small in size; its use is extremely simple. In the figure the attachment, connected to a TT-1 apparatus, and a view of the internal wiring of the attachment are shown.

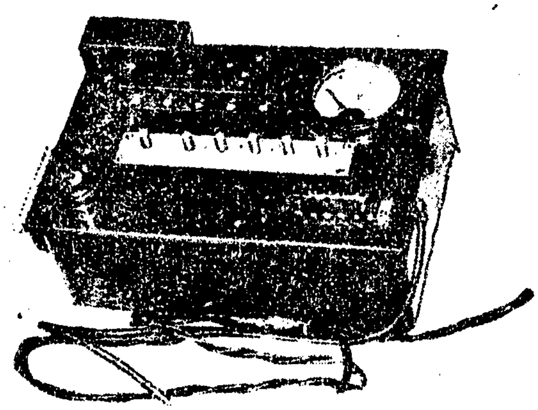
PARALLEL OPERATION OF PHANOTRONS



Senior engineer of the ultrashort-wave radio station of Moscow television center V. F. Petrov, and engineer V. A. Yevdokimov, have proposed the use of parallel connection of phanotrons in rectifiers. When this is done invariant operation of the rectifier is obtained, and the phanotrons are utilized completely (until discharged from the system) (when one of the phanotrons is discharged the other phanotron assumes the entire load).

A check of this proposal in practice has confirmed the expediency of parallel connection of phanotrons.

APPARATUS FOR CHECKING OF SIGNAL CALLING SETUPS OF THE 10-STEP SYSTEM

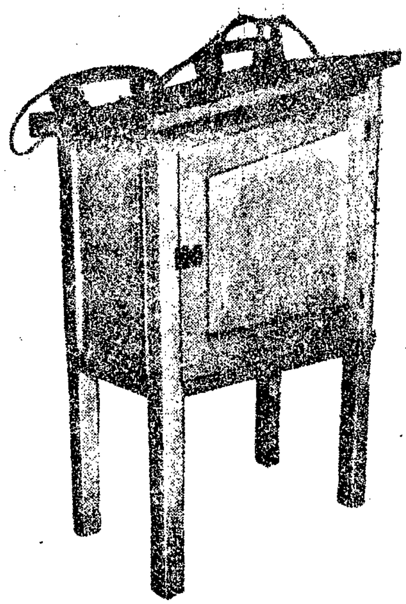


Senior electrotechnician of the central telephone generator junction of the city of Moscow S. N. Zarubin has developed a special device for checking signal calling setups of the 10-step system after preventive examination and repair.

With the aid of this device it is possible to check all the electrical circuits of the apparatus (signal, magneto, and impulse) without attaching the repaired signal call setup to the operating ATS (automatic office) facilities, and also to measure the voltages in the circuit of the magneto current and in the circuits of the buzzer currents.

DEVICE FOR CHECKING COUNTER ASSEMBLIES

Engineers of the central telephone junction of the city of



Moscow M. A. Alekseev and A. G. Zamotin have developed a device for checking counter assemblies of intermediate facilities, permitting joint operation of the ATS (automatic office) machine and 10-step systems.

The device is designed in the form of a movable benchboard and consists of a checking device and a five-row key pulser, with the aid of which any five-unit number can be selected.

When the device is connected to the counter assembly, the work of this assembly, the condition of the wires a, b, and c, and of the devices participating in the connection, as well as the correctness of the establishment of the connection (in accord with the number selected by the key pulser) are checked. At the same time the relay of

the signals of answer and ring-off on the part of the called subscriber is checked. The results of the check are noted by lighting of the corresponding signal lamps.

NEW LITERATURE ON PROBLEMS OF COMMUNICATIONS

Azrilyant, P. A. and Belkina, M. G. Numerical Results of the Defraction Theory of Radio Waves around the Earth's Surface. Second edition. Publishing house "Soviet Radio," Moscow, 1957, 45 pages plus 44 insets. Price 8 r. 80 k.

In the monograph the results of calculation of the weakening factors of the electromagnetic field of radio waves by horizontal and vertical polarization for a normal distribution of waves around the earth are collected in the form of tables and graphs. The book is designed for radio engineers concerned with the calculation of the distribution of radio waves and the design of radar devices.

Astakhov, N. P., Davydov, V. V., Serebrennikov, I. A., Khavin, N. Z., and Engel', G. A. Reinforced Concrete Supports for Electric Lines and Communications Lines. State Electric Power Publishing House, M.-L., 1957, 52 pages (Ministry of Electric Stations USSR. Technical Administration.) Price 1 r. 55 k.

Indications are given of the organization of manufacture of reinforced concrete units under field conditions, selection of the type of unit, and their exploitation.

Golubtsov, M. G. Electromechanical Filters of Radio Frequencies. State Electric Power Publishing House, M.-L., 1957, 48 pages (Radio Library of the Masses. Issue 282.) Price 1 r. 15 k.

The physical bases for the theory of oscillations of mechanical bod-

ies are presented briefly, an explanation of the work of basic types of electromechanical band filters is given; information on the design, manufacture, and assembly of electromechanical filters within the necessary limits, for independent manufacture of these filters by radio amateurs, is presented.

Gol'dreyer, I. G. Voltage Stabilizers. Second edition, revised. State Electric Power Publishing House, M.-L., 1957, 227 pages. Price 7 r. 75 k.

General problems of voltage stabilization and methods of construction, circuits, and elements of stabilizers are considered, a number of circuits of compensating and parametric voltage stabilizers are presented. The book is designed for engineers and technicians concerned with the development, manufacture, and exploitation of voltage stabilizers, as well as for the students and faculties of electrotechnical colleges.

Instruction manual on the tuning of medium-wave broadcasting antennas. Communications Publishing House, Moscow, 1958, 79 pages (Ministry of Communications USSR. Main Radio Management.) Free.

In the instruction manual methods and sequence of measurements of electric parameters, of tuning the operating waves, and of correcting the frequency characteristics of broadcasting antenna are presented. The instruction manual was developed for basic types of antennas operating within a wave range of 200 - 2000 m and completed in the form of metallic mast antennas and tower antennas.

Kazanskiy, N. V. Circuits of the UHF Apparatus. State Electric Power Publishing House, M.-L., 1957, 32 pages (Radio Library of the Masses. Issue 279.) Price 75 kop.
Contains brief descriptions of battery and network UHF receivers and receiver-transmitters, designed for work in the ranges of 38, 144, and 420 mc, which were published in various brochures and in the journal "Radio."

Korobovkin, V. V. and Nefedov, A. M. All-Wave Amateur Radio Receiver. State Electric Power Publishing House, M.-L., 1957, 32 pages (Radio Library of the Masses. Issue 280.) Price 75 kop.
The circuit and construction of an eight tube amateur all-wave superheterodyne receiver with UHF range is described; a detailed description of the self-made details used in this receiver is presented; recommendations for its assembly and adjustment are given.

New works in the field of wire communications. Informational collection "Techniques of Communications." Communications Publishing House, Moscow, 1957, 86 pages. Price 2 r. 60 k.
The collection includes articles written by co-workers of the NIITS: Ye. G. Koblents and D. A. Yakovenko "Contactless Ferro-Resonance Devices," K. T. Kaufel'dt and N. I. Mel'nikov "Two-Way Sequence Type Amplifier on Semiconducting Triodes for Urban and Suburban Telephone Networks," L. I. Rabkin and Z. I. Novikov "On the Problem of Designing Coils with Shell-Type and Toroidal Cores," Z. Ya. Gel'mont "Narrow-Band Quartz Filters for the Frequency Range 1-10 mc," V. V.

Shtager "Nomographic Method of Calculating the Operating Phase Constant."

Ramlau, P. N. Radio Techniques. Third edition, revised. Railway Transport Publishing House, M., 1957, 302 pages. Price 9 r. 80 k.

The theoretical bases for radio techniques are presented; radio transmitting and radio receiving devices, techniques of ultrahigh frequencies, and the bases of television and radar are considered. The book is authorized as a textbook for railway transport institutes.

Collection of scientific works. Number 1. Leningrad, 1957, 110 pages. (Ministry of Communications USSR. Scientific Research Institute of Urban and Rural Telephone Communications.) Free. The collection includes the articles: E. V. Zelyakh "An Approximate Method of Design of a Wide-Band Piezoelectric Filter with Symmetrical Damping Peaks," N. A. Chernyak "Synthesis of Circuits Creating a Constant Phase Difference in a Wide Band of Frequency," V. V. Shtager "Calculation of the Unbalanced Lines of the Time Lag of Pulses," and V. I. Tsapalinaya "Transient Conditions in Transformers of the Dynamic Range of Transmission."

Systems of high-frequency telephone installation on interurban cable lines. Informational collection "Techniques of Communications Abroad." Communications Publishing House, Moscow, 1958, 115 pages. Price 3 r. 85 k.

Contains articles explaining experiments of certain foreign countries

on multiplexing coaxial and symmetrical cables of long-distance communications. The collection contains brief descriptions of the multiplexing systems S900 - 101 and V960 for communications along coaxial cables and the multiplexing systems V60 and V120 for communications along symmetrical cables.

Soloveychik, L. M. Cost of Production in the Economy of Communications and Means of Lowering It. Second edition, revised and expanded. Communications Publishing House, Moscow, 1958, 64 pages (Ministry of Communications USSR. Technical Management. Lectures on the Economics of Communications.) Price 2 r. 10 k..

Second edition of the lectures, revised and considerably expanded with material on experience in using the index of production cost on communications undertakings set up on a self-supporting basis.

Solov'yev, N. N. Bases of Measuring Techniques of Wire Communications. Part II. State Electric Power Publishing House, M.-L., 1957, 460 pages plus one insert. Price 15 r. 75 k.

In the second part of the book changes in voltages, currents, power, resistances, conductivities, capacitances, inductances, frequencies, and a number of other derived parameters as applied to the approximate operating frequency range of 10 cycles to 10 mc are considered.

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END